SOUTH FLORIDA WATER MANAGEMENT DISTRICT

LOWER KISSIMMEE BASIN WATER SUPPLY PLAN UPDATE

Planning Document/Appendices

2019

Acknowledgments

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Furthermore, the SFWMD expresses appreciation to all staff who contributed to the development and production of this plan update.

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Executive Summary

The South Florida Water Management District's (SFWMD's) strategic goal for its water supply plans is to identify sufficient water supply sources and projects to meet existing and future reasonable-beneficial uses during 1-in-10 year drought conditions while sustaining water resources and related natural systems. This *2019 Lower Kissimmee Basin Water Supply Plan Update* (2019 LKB Plan Update) is the first update to the *2014 Lower Kissimmee Basin Water Supply Plan*. This plan update is consistent with the water supply planning requirements of Chapter 373, Florida Statutes, and presents population and water demand projections through 2040, a review of water supply issues and evaluations, and a list of water source options. It also examines local and regional water supply efforts completed since the 2014 plan and describes water resource development projects.

This 2019 LKB Plan Update was developed in an open, public forum. Meetings and workshops were held with water users, local and tribal governments, utilities, agricultural and industry representatives, and environmental representatives to solicit input, provide information about planning results, and receive comments on draft sections.

The LKB Planning Area covers approximately 1,805 square miles, including portions of Glades, Highlands, and Okeechobee counties. The Seminole Tribe of Florida's Brighton Reservation is within this planning area and the Tribe's surface water entitlement pursuant to the 1987 Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the SFWMD is discussed in this plan update. Additionally, the LKB Planning Area generally lies within the Lake Okeechobee watershed. While a portion of the Lake Okeechobee Service Area (LOSA) is within the LKB Planning Area, the entire LOSA is addressed in the SFWMD's Lower East Coast water supply plan updates (last updated in 2018).

Typically, the LKB Planning Area receives abundant rainfall, with volumes exceeding human and natural system needs during wet periods. Water availability varies annually and includes periodic drought years. Annual precipitation averages between 45 and 50 inches, with nearly two-thirds of rainfall occurring between June and October. There is an extensive network of canals and waterworks used for water supply and flood control in the LKB Planning Area, including the C-38 (Kissimmee River), C-40, C-41, C-41A, and Istokpoga canals.

DEMAND ESTIMATES AND PROJECTIONS

As described in **Chapter 2**, the LKB Planning Area is home to nearly 52,500 people and supports a large agricultural industry. The permanent population is projected to exceed 58,600 people by 2040, a 12 percent increase from the 2017 base year estimate for this plan update. Approximately 75 percent of the LKB Planning Area's permanent population resides in Okeechobee County.

Agriculture is a substantial part of the regional economy. Agricultural irrigated acres are projected to remain relatively stable, increasing approximately 3 percent, from 119,000 acres in 2017 to 123,000 acres in 2040. Hay/pasture is the dominant crop in the LKB Planning Area, covering more than 43,000 acres. However, hay/pasture acreage is projected to decrease slightly by 2040, to just under 38,000 acres. Citrus also is a dominant crop in the region, accounting for more than 38,000 acres in 2017 and nearly 37,000 acres in 2040.

Total average water demands by all use categories are projected to increase approximately 5 percent, from an average of approximately 245 million gallons per day (mgd) in 2017 to 257 mgd in 2040 (**Table ES-1**). Projected 1-in-10 year demands are estimated to increase by slightly less than 5 percent.

Agricultural Irrigation (AGR) is projected to remain the largest water use category in the LKB Planning Area, accounting for 96.4 percent of the total 2040 projected demand. Public Water Supply (PWS) is the second largest water use category in the LKB Planning Area, representing only 1.3 percent of the total 2040 projected demand. Domestic and Small Public Supply (DSS), Industrial/Commercial/Institutional (ICI), and Recreational/Landscape Irrigation (REC) collectively account for 2.3 percent of the total 2040 projected demand. There are no Power Generation (PWR) facilities currently operating in the LKB Planning Area, and the demands are projected to remain at 0.00 mgd through the planning horizon.

Table ES-1. Estimated and projected average gross water demands (in mgd) in the LKB Planning Area for 2017 and 2040.

Water Use Category	2017 Estimated Use	2040 Projected Demand	Percent Change	Percent of Projected 2040 Total Demand
AGR	237.02	248.14	4.7%	96.4%
PWS	3.04	3.39	11.5%	1.3%
DSS	2.02	2.28	12.9%	0.8%
ICI	1.70	1.95	14.7%	0.8%
REC	1.64	1.73	5.5%	0.7%
PWR	0.00	0.00	0.0%	0.0%
Total	**245.42**	**257.49**	**4.9%**	**100.0%**

AGR = Agricultural Irrigation; DSS = Domestic and Small Public Supply; ICI = Industrial/Commercial/Institutional; LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWR = Power Generation; PWS = Public Water Supply; REC = Recreational/Landscape Irrigation.

DEMAND MANAGEMENT: WATER CONSERVATION

In general, water conservation by all water use categories is important to meet future water needs. Conservation programs, described in **Chapter 3**, often are among the lowest-cost solutions to meet future demands and can reduce costs over the long term if properly planned and implemented. Due to the dominance of agriculture in the LKB Planning Area, conservation efforts likely will be most effective for agricultural operations. Analysis suggests the AGR use category can save nearly 17 mgd by 2040 through irrigation efficiency and scheduling improvements.

NATURAL SYSTEMS AND RESOURCE PROTECTION

Natural surface water systems in the LKB Planning Area include the Kissimmee River, Arbuckle Creek, Lake Istokpoga, Fisheating Creek, Taylor Creek, Nubbin Slough, and Lake Okeechobee. The water supply needs for natural systems are protected and addressed through regulatory mechanisms, restoration projects, and water resource development projects.

Minimum Flows and Minimum Water Levels (MFLs) that affect the LKB Planning Area have been adopted for Lake Istokpoga, Lake Okeechobee, and the Lower West Coast Aquifers (**Chapter 4**). Prevention strategies have been adopted for the Lake Istokpoga and Lower West Coast Aquifers MFLs, and a recovery strategy has been adopted for the Lake Okeechobee MFL. The MFL for Lake Okeechobee affects portions of the LKB Planning Area but is described in the SFWMD's Lower East Coast water supply plan updates (last updated in 2018). To date, no Water Reservations have been adopted in the LKB Planning Area. However, the SFWMD is in the process of developing Water Reservations for the Kissimmee River and Chain of Lakes that will reserve water needed for the protection of fish and wildlife. Restricted Allocation Area rules have been established for the Lake Istokpoga/Indian Prairie Canal System and LOSA.

Large ecosystem restoration projects are under way in the LKB Planning Area (**Chapter 7**). Ecosystem restoration projects are vital to maintaining the health of the region's water resources, including elements identified in MFL recovery and prevention strategies. The Comprehensive Everglades Restoration Plan (CERP), a partnership between the United States Army Corps of Engineers and the SFWMD, is a critical component of water supply planning in the LKB Planning Area. CERP includes capital projects needed to protect and restore natural systems and enhance water availability. The primary CERP component in the LKB Planning Area is the Lake Okeechobee Watershed Restoration Project. The project aims to improve lake levels, decrease harmful discharges to estuaries, improve wetland habitats, and increase water supply for existing legal users of Lake Okeechobee. In addition, the Kissimmee River Restoration Project, which is nearing completion, will re-establish flow to approximately 40 miles of historical river channel and restore almost 25,000 acres of floodplain wetlands.

WATER SOURCE OPTIONS

Water users in the LKB Planning Area rely on surface water from Lake Istokpoga and Lake Okeechobee (and their connected canals) as well as fresh groundwater from the surficial and Floridan aquifer systems (SAS and FAS) to meet urban and agricultural water demands (**Chapter 5**). The SFWMD also uses water from Lake Istokpoga and Lake Okeechobee to ensure surface water availability within the Indian Prairie Canal System so the Seminole Tribe of Florida can withdraw its entitled surface water amount, as specified in the 1987 Water Rights Compact. Total water use in the planning area is projected to rise only moderately over the planning period (**Chapter 2**). Because the Lake Istokpoga/Indian Prairie Canal System and LOSA Restricted Allocation Areas currently limit surface water availability from these sources (**Chapter 4**), additional demands are expected to be met with groundwater from the FAS.

Traditional water sources (i.e., fresh surface water and fresh groundwater) appear sufficient to meet the projected water demands of the LKB Planning Area through 2040. Currently, alternative water supply options (e.g., brackish groundwater, reclaimed water, water stored in aquifer storage and recovery wells and in aboveground reservoirs) are not required to meet future demands of the region but may be appropriate at individual locations.

WATER RESOURCE ISSUES AND ANALYSES

Although water sources appear adequate to meet projected 2040 demands for this 2019 LKB Plan Update, there are issues, similar to those identified in the previous plan, that affect the availability of water in the LKB Planning Area. Issues that need to be addressed as part of water supply planning in the region include environmental water needs for the Kissimmee River Restoration Project, regulatory limitations on surface water bodies, surface water entitlement for the Seminole Tribe of Florida, effects of groundwater withdrawals on Lake Wales Ridge MFL water bodies, and effects of climate change on AGR needs. Considering those issues, multiple data and information sources were used to evaluate the region's water resources, including their availability and ability to meet projected demands. The SFWMD recognized the findings and conclusions of the evaluations and analyses conducted as part of the previous water supply plan are still representative to address the 2040 projected water demands for the region. Additionally, a recent SFWMD analysis of available data from groundwater monitoring wells in the LKB Planning Area showed that while groundwater levels fluctuate seasonally, generally there are no marked upward or downward trends in water levels.

FUTURE DIRECTION

Chapter 8 of this 2019 LKB Plan Update contains guidance to help focus future efforts to meet projected water demands in the region. Some key suggestions are as follows:

- Agricultural users are encouraged to reduce or augment use of surface water with projects such as stormwater and tailwater recovery, the blending of brackish groundwater with fresh water, and more efficient water conservation practices, where appropriate.
- Aquifer storage and recovery systems should be developed, where appropriate, to store excess surface water for flood protection, environmental protection/restoration, and agricultural and urban water supply needs.
- Complete the Kissimmee River Restoration Project to re-establish flow to approximately 40 miles of historical river channel and restore almost 25,000 acres of floodplain wetlands.
- Complete the Kissimmee River and Chain of Lakes Water Reservations to reserve water needed for the protection of fish and wildlife.
- Finalize and implement the components identified in the Lake Okeechobee Watershed Restoration Project Tentatively Selected Plan. Part of CERP, the Lake Okeechobee Watershed Restoration Project is expected to increase the watershed's storage capacity and improve the quantity and timing of water deliveries to Lake Okeechobee.
- Local water users and utilities developing FAS wellfields are encouraged to collaborate with the SFWMD. Water quality, water level, and hydrologic data from such wells can be used in SFWMD regional models and can increase knowledge and understanding of the FAS.

CONCLUSIONS

Building on the findings and conclusions of the *2014 Lower Kissimmee Basin Water Supply Plan*, this 2019 LKB Plan Update assesses water supply demands and available sources for the LKB Planning Area through 2040. Sufficient water appears to be available for users to meet 2040 projected water demands during 1-in-10 year drought conditions. Currently, this level of certainty is reduced to 1-in-6 year drought conditions for water users (primarily agriculture) that rely solely on surface water from Lake Okeechobee or its tributaries within the LOSA portion of the planning area. The potential for additional water from Lake Okeechobee resulting from operational changes or a revised regulation schedule is discussed in the SFWMD's 2018 update to the Lower East Coast water supply plan.

This plan update concludes that future water needs of the region can be met through the 2040 planning horizon with appropriate management and conservation. Successful implementation of this 2019 LKB Plan Update requires close coordination and collaboration with agricultural interests, local and tribal governments, utility water supply planning entities, and other stakeholders. This partnering should ensure that water resources in the LKB Planning Area continue to be prudently managed and available to meet future demands while also protecting the environment.

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Acronyms and Abbreviations

2008 LORS	2008 Lake Okeechobee Regulation Schedule
AFSIRS	Agricultural Field Scale Irrigation Requirements Simulation
AGR	Agricultural Irrigation
ASR	aquifer storage and recovery
AWS	alternative water supply
BEBR	Bureau of Economic and Business Research
BMP	best management practice
C&SF Project	Central and Southern Florida Flood Control Project
CERP	Comprehensive Everglades Restoration Plan
CFP	Cooperative Funding Program
CFWI	Central Florida Water Initiative
District	South Florida Water Management District
DSS	Domestic and Small Public Supply
ECFTX	East Central Floridan Transient Expanded (model)
EQIP	Environmental Quality Incentives Program
F.A.C.	Florida Administrative Code
F.S.	Florida Statutes
FAS	Floridan aquifer system
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FSAID	Florida Statewide Agricultural Irrigation Demand
FY	Fiscal Year
IAS	intermediate aquifer system
ICI	Industrial/Commercial/Institutional
ICU	intermediate confining unit
IMWID	Istokpoga Marsh Watershed Improvement District
LFA	Lower Floridan aquifer
LKB	Lower Kissimmee Basin
LKBGWM	Lower Kissimmee Basin Groundwater Model
LOSA	Lake Okeechobee Service Area
LOSOM	Lake Okeechobee System Operating Manual

LOWCP	Lake Okeechobee Watershed Construction Project
LOWPP	Lake Okeechobee Watershed Protection Plan
LOWRP	Lake Okeechobee Watershed Restoration Project
MFL	Minimum Flow and Minimum Water Level
mgd	million gallons per day
NEEPP	Northern Everglades and Estuaries Protection Program
NGVD29	National Geodetic Vertical Datum of 1929
PCUR	per capita use rate
PWR	Power Generation
PWS	Public Water Supply
RAA	Restricted Allocation Area
REC	Recreational/Landscape Irrigation
SAS	surficial aquifer system
SFER	South Florida Environmental Report
SFWMD	South Florida Water Management District
SJRWMD	St. Johns River Water Management District
STA	stormwater treatment area
SWFWMD	Southwest Florida Water Management District
SWUCA	Southern Water Use Caution Area
TDS	total dissolved solids
UFA	Upper Floridan aquifer
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WTP	water treatment plant
WWTF	wastewater treatment facility

1

Introduction

TOPICS

- 2019 LKB Plan Update
- Goal and Objectives
- Legal Authority and Requirements
- Seminole Tribe of Florida Brighton Reservation
- Regional and Local Planning Linkage
- Plan Development Process
- Planning Area Description
- Water Resources Overview
- Progress Since the 2014 LKB Plan

The South Florida Water Management District (SFWMD or District) develops and updates regional water supply plans to provide for current and future water needs while protecting Central and South Florida's water resources. This *2019 Lower Kissimmee Basin Water Supply Plan Update* (2019 LKB Plan Update) assesses existing and projected water needs as well as water sources to meet those needs through 2040 for the portions of Glades, Okeechobee, and Highlands counties generally northwest of Lake Okeechobee and the Seminole Tribe of Florida's Brighton Reservation (**Figure 1-1**). This 2019 LKB Plan Update presents population estimates, water demands and projections (**Chapter 2**), water resource and water supply development projects (**Chapter 7**), and related water supply planning information for the 2017-2040 planning horizon. Designed to be a guide for local and tribal governments and other water users, this document provides a framework for water supply planning and management decisions in the LKB Planning Area.

2019 LKB PLAN UPDATE

The 2019 LKB Plan Update reflects the changes experienced in the LKB Planning Area since 2014 and the effects of those changes on water use and projected demands. The 2019 LKB Plan Update consists of two documents: a planning document with appendices and the *2016 Water Supply Plan Support Document* (SFWMD 2016). The planning document and appendices focus on the LKB Planning Area. The Support Document addresses aspects common to all five SFWMD regional planning areas and contains background material and information on water resource technologies.

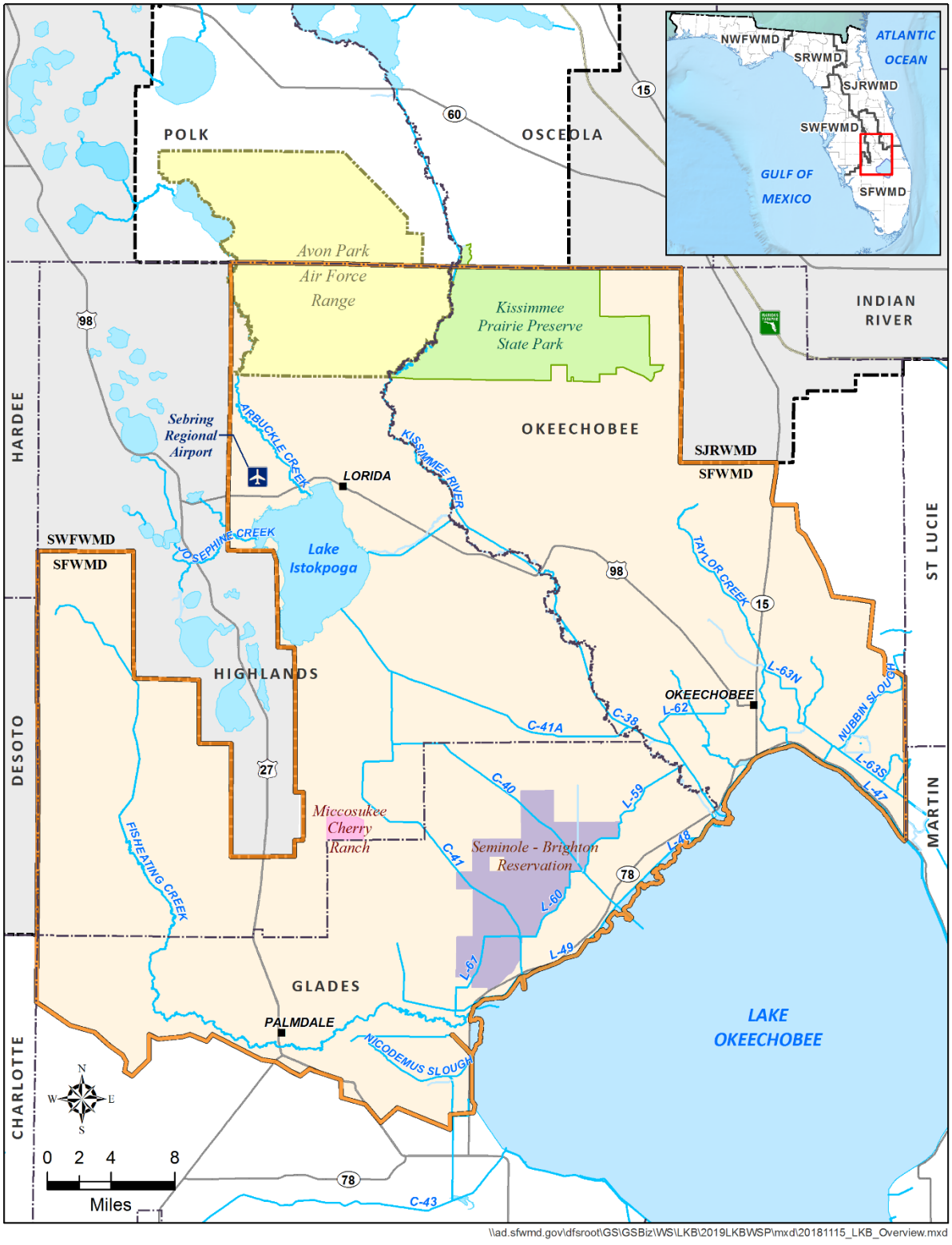

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Figure 1-1. Lower Kissimmee Basin Water Supply Planning Area.

GOAL AND OBJECTIVES

The goal of the 2019 LKB Plan Update is to identify sufficient water supply sources and future projects to meet existing and future reasonable-beneficial uses during 1-in-10 year drought conditions through 2040 while sustaining water resources and natural systems. The objectives of the 2014 LKB Plan (SFWMD 2014) were reviewed and modified to develop the following objectives for this 2019 LKB Plan Update:

1. **Water Supply** – Identify sufficient sources of water and, if necessary, water supply projects to meet reasonable-beneficial consumptive uses projected through 2040 under 1-in-10 year drought conditions without causing harm to natural resources.

2. **Natural Systems** – Protect and enhance environmental systems, including the Kissimmee River, Lake Istokpoga, Fisheating Creek, Taylor Creek, Nubbin Slough, and other federal, state, and locally identified natural resource areas.

3. **Conservation** – Encourage water conservation measures to improve the efficiency of existing and future water use.

4. **Linkage with Local and Tribal Governments** – Provide information to support local government Comprehensive Plans. Promote compatibility of the plan update with local and tribal government land use decisions.

5. **Compatibility and Linkage with Other Efforts** – Promote compatibility and integration with the following planning-related activities:
    - Other state and federal water resource initiatives in the planning area;
    - Existing and proposed environmental projects;
    - Modifications to operating schedules for the regional systems, including Lake Okeechobee; and
    - Water use permitting process, Minimum Flow and Minimum Water Level (MFL) criteria, and Water Reservations.

LEGAL AUTHORITY AND REQUIREMENTS

The legal authority and requirements for water supply planning are included in Chapters 373, 403, 187, and 163, Florida Statutes (F.S.). In accordance with Florida's Water Protection and Sustainability Program, regional water supply plans and local government Comprehensive Plans must ensure adequate potable water facilities are constructed and concurrently available to meet the demands of new development. The water supply planning region identified in this plan shall be considered a Water Resource Caution Area under Section 403.064, F.S., and affected parties may challenge the designation pursuant to Section 120.569, F.S.

Since 2013, there have been changes to Section 373.709, F.S., regarding regional water supply planning. These changes include considering agricultural projections provided by the Florida Department of Agriculture and Consumer Services (FDACS) and a required annual report to the Florida Department of Environmental Protection (FDEP) on the status of water resource development and water supply development projects.

In addition to water supply planning, the SFWMD is required by statute to provide updates for a variety of resource development, restoration, and monitoring programs implemented within the District's boundaries. Such updates are provided in the annual publication of the *South Florida Environmental Report*, which is referenced as needed in this plan update.

SEMINOLE TRIBE OF FLORIDA BRIGHTON RESERVATION

The Seminole Tribe of Florida is a federally recognized Indian Tribe organized pursuant to Section 16 of the Indian Reorganization Act of 1934 and recognized by the State of Florida pursuant to Chapter 285, Florida Statutes. The Seminole Tribe of Florida's Brighton Reservation encompasses 35,295 acres within the southern portion of the LKB Planning Area (**Figure 1-1**). Much of the land is used for various agricultural purposes and a small population of fewer than 1,000 permanent residents. The Seminole Tribe of Florida has a surface water entitlement pursuant to the 1987 Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the SFWMD [Public Law 100-228, 101 Statute 1566, and Chapter 87-292, Laws of Florida, as codified in Section 285.165, F.S.]. Generally, the Tribe is entitled to 15 percent of the total amount of water that can be withdrawn from SFWMD canals and borrow canals by all users from surface water within the Indian Prairie Basin, calculated by the SFWMD on a monthly basis. The parties executed subsequent documents addressing the entitlement. The *Agreement Between SFWMD and the Seminole Tribe of Florida and Water Supply Plan for the Brighton Reservation Implementing Section VI.B of the Compact and Subparagraph 3.3.32.A.3 of the Criteria Manual* (Agreement No. C-4121) describes the optimal levels for various canal stretches that would allow the Tribe to withdraw the entitlement and outlines an operational plan for releases from Lake Istokpoga or Lake Okeechobee during normal and water shortage conditions. The *Agreement between the South Florida Water Management District and the Seminole Tribe Providing for Water Quality, Water Supply, and Flood Control Plans for the Big Cypress Seminole Indian Reservations and the Brighton Seminole Indian Reservation, Implementing Sections V.C. and VI.D. of the Water Rights Compact* (usually referred to as the 1996 Agreement) addresses the SFWMD's mitigation responsibilities regarding impacts to the Seminole Tribe of Florida's ability to obtain surface water supplies at the Brighton Reservation.

REGIONAL AND LOCAL PLANNING LINKAGE

The SFWMD's water supply planning process is closely coordinated with and linked to the local water supply planning of city/county governments and utilities. Coordination and collaboration among all water supply planning entities is needed throughout the regional water supply plan development and approval process.

Since 2014, the SFWMD has worked with Public Water Supply (PWS) utilities to evaluate their current and future water supply needs for this 2019 LKB Plan Update. Although Comprehensive Plans, Work Plans, and water use permits are prepared at different times, each uses the latest and best available data. **Appendix A** provides information and statutory requirements relevant to local government Comprehensive Plans. The regional and local water supply planning process is described below and illustrated in **Figure 1-2**.

PROCESS

Regional and Local Water Supply Planning Process

On an annual basis, the SFWMD receives input from PWS utilities identifying water supply projects needed to meet projected future demands. The SFWMD also considers water supply projects in local government Work Plans, Tribal Work Plans, and adopted Sector Plans, which are required to identify needed water supplies and available water sources [Section 163.3245(3)(a)2., F.S.].

The SFWMD is required to notify each utility of the water supply projects that have been included in the water supply plan update for the utility's consideration. Utilities then must respond to the SFWMD about their intentions to develop and implement the identified projects or provide a list of other projects (or methods) to meet projected demands [Section 373.709(8)(a), F.S.].

By November 15 of every year, all utilities are required to submit a progress report to the SFWMD regarding the status of their water supply projects (e.g., completed, under way, planned for implementation).

Pursuant to the 1987 Water Rights Compact, the Seminole Tribe of Florida submits Work Plans and Work Plan Amendments to the SFWMD describing new projects on a Tribal Reservation or Tribal Trust Lands.

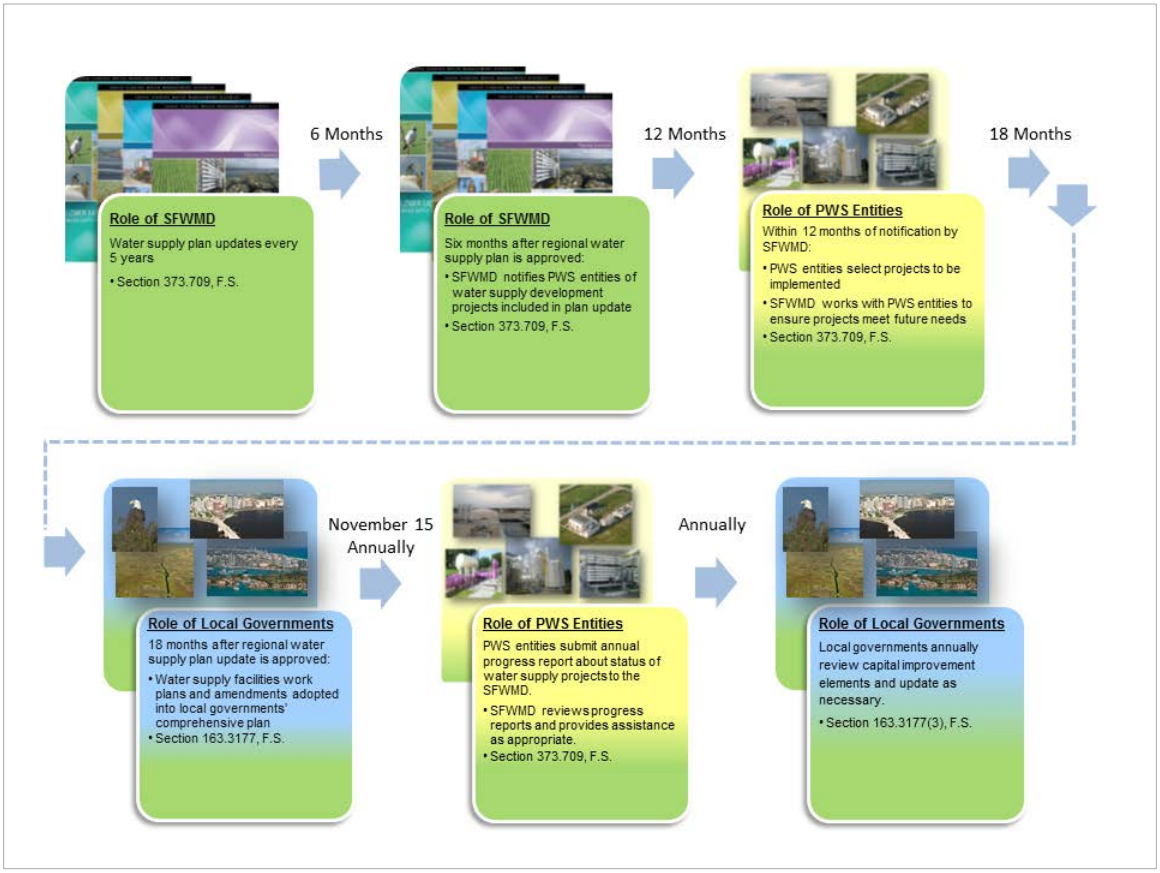

Figure 1-2. Linking regional water supply planning with local government comprehensive planning.

PLAN DEVELOPMENT PROCESS

This 2019 LKB Plan Update describes how anticipated water supply needs will be met in the LKB Planning Area through 2040. The planning process used to develop this plan is outlined below.

PLAN DEVELOPMENT PROCESS

1	2	3	4
Planning and Assessment	**Data Collection, Analysis, and Issue Identification**	**Evaluation of Water Resources and Water Source Options**	**Identify Water Resource and Water Supply Development Projects**
The process incorporated public participation and coordination with local stakeholders, utilities, agricultural representatives, nongovernmental environmental groups, tribal representatives, local governments, the FDEP, FDACS, and other state and federal agencies. A review of previous planning efforts in the region and documentation of activities since the approval of the 2014 LKB Plan were key starting points.	Using the 2014 LKB Plan as a foundation, developing this plan update involved collecting the latest information on population, water demands (**Chapter 2**), water conservation (**Chapter 3**), water resource protections (**Chapter 4**), water source options (**Chapter 5**), and water resource analyses (**Chapter 6**).	The next phase of the planning process involved reviewing existing solutions or developing new solutions to address the identified issues. If there were areas where projected demand exceeds available supplies, water supply project options were identified, including alternative water supplies and water conservation.	In areas where water resource conditions warranted, water resource development projects were identified (**Chapter 7**). If needed, water supply development projects intended to meet water needs over the planning horizon were identified, compiled, and evaluated by the SFWMD with input from stakeholders, the public, and other agencies.

Public Participation

Public participation is a key component of the water supply plan development process to ensure the plan address the issues and concerns of stakeholders, and that the future direction and projects are appropriate to meet future water needs. The SFWMD held two local workshops within the LKB Planning Area during the water supply plan update process. Stakeholders representing a variety of interests in the LKB Planning Area—agriculture, tribal, industry, environmental protection, utilities, local government planning departments, and state and federal agencies—were invited to attend the workshops. During the workshops, participants reviewed and commented on projected demands and other key plan elements compiled by the SFWMD.

Individual discussions also occurred throughout the plan development process with local government planning departments, utilities, the Seminole Tribe of Florida, other planning agencies, and agricultural representatives to discuss water demand projections and to coordinate planning processes. Participants reviewed and provided input on water supply issues, the condition of regional water resources, water source options, and other aspects of the water supply plan update. A draft of this plan update was made available for public review, and comments were considered in finalization of the document. Additionally, presentations regarding the plan update were made to the District Governing Board.

PLANNING AREA DESCRIPTION

The LKB Planning Area encompasses approximately 1,805 square miles of Central Florida. To the northeast of the planning area is the St. Johns River Water Management District (SJRWMD), and to the east is the SFWMD's Upper East Coast Planning Area. At the northern boundary of the planning area are the Avon Park Air Force Range and the Kissimmee Prairie Preserve State Park (**Figure 1-1**). The Seminole Tribe of Florida's Brighton Reservation (discussed earlier) and the Miccosukee Tribe of Indians of Florida's Cherry Ranch property also are within the planning area. The western boundary is adjacent to the Southwest Florida Water Management District (SWFWMD). The area's elevation ranges from 0 to 160 feet above mean sea level. Much of the elevation change is due to Lake Wales Ridge, which generally exceeds 100 feet above mean sea level (**Figure 1-3**). The crest of the ridge forms the water divide between the SFWMD and SWFWMD, although the base of the ridge is used as the district boundary. Most surface waters east of the ridge drain toward the Kissimmee River.

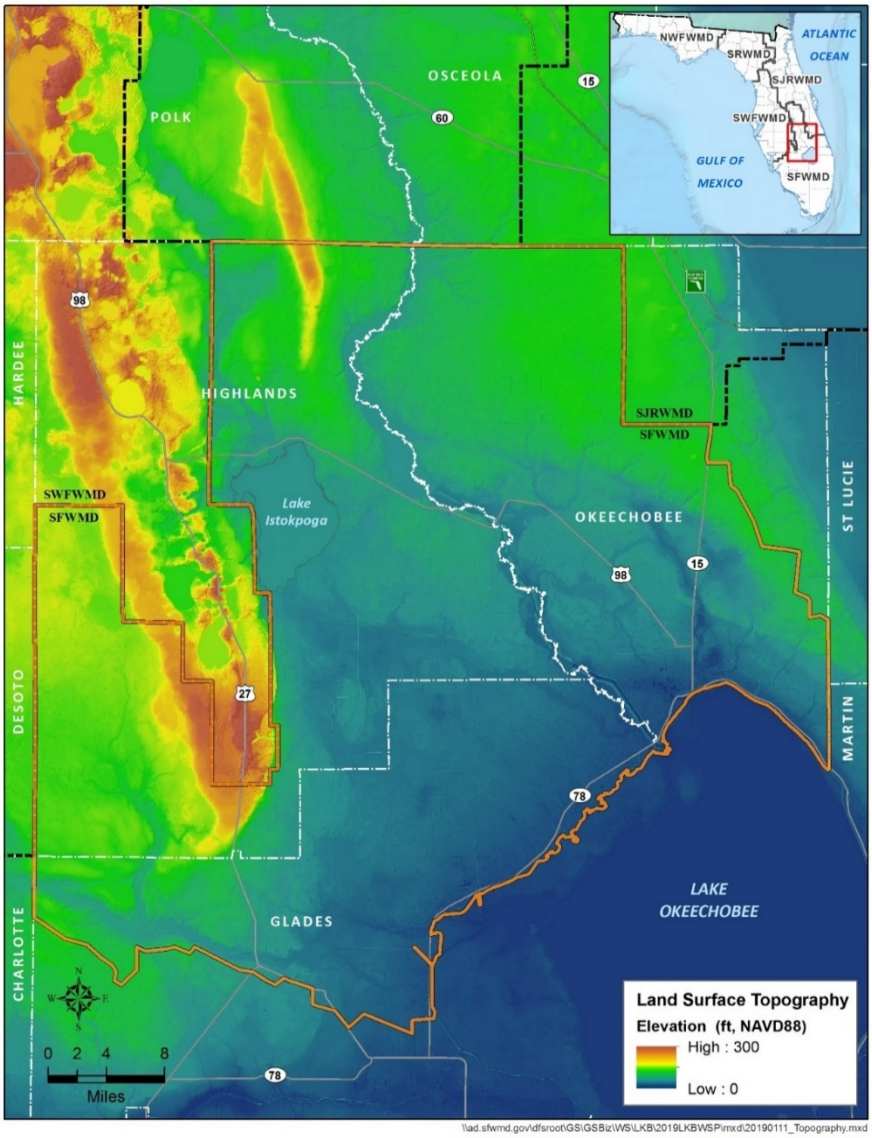

Figure 1-3. Topography of the LKB Planning Area and surrounding region.

In addition to Lake Wales Ridge, other major physiographic regions in the LKB Planning Area include the Okeechobee Plain, Osceola Plain, DeSoto Plain, and Caloosahatchee Incline (**Figure 1-4**). The Caloosahatchee Incline is the transition zone from Lake Wales Ridge to the Okeechobee Plain. The incline gently slopes eastward and ranges between 30 and 40 feet above mean sea level. The Okeechobee Plain, adjacent to Lake Okeechobee, spans approximately 900 square miles. The plain gradually slopes southward from an elevation of 30 to 40 feet above mean sea level in the north to approximately 20 feet above mean sea level at the northern shore of Lake Okeechobee.

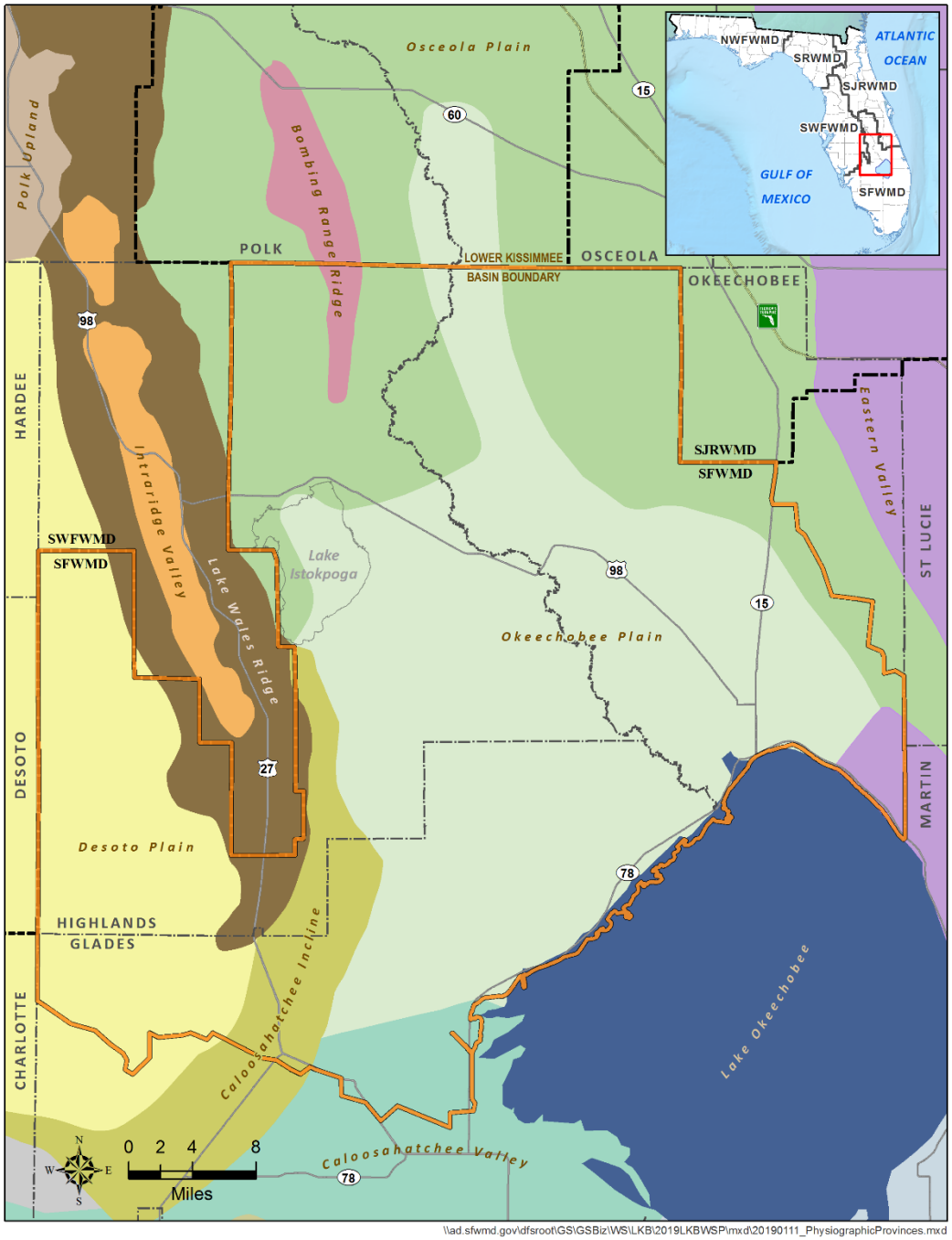

Figure 1-4. Physiographic regions of the LKB Planning Area.

The LKB Planning Area generally is within the large Lake Okeechobee watershed, and there are five subwatersheds (basins) at least partially within the planning area boundaries: Lower Kissimmee River, Taylor Creek/Nubbin Slough, Lake Istokpoga, Indian Prairie, and Fisheating Creek (**Figure 1-5**). These subwatersheds have hydrologic relationships with the Kissimmee River, Lake Istokpoga, Fisheating Creek, and the tributaries and canals associated with these water bodies that eventually drain into Lake Okeechobee.

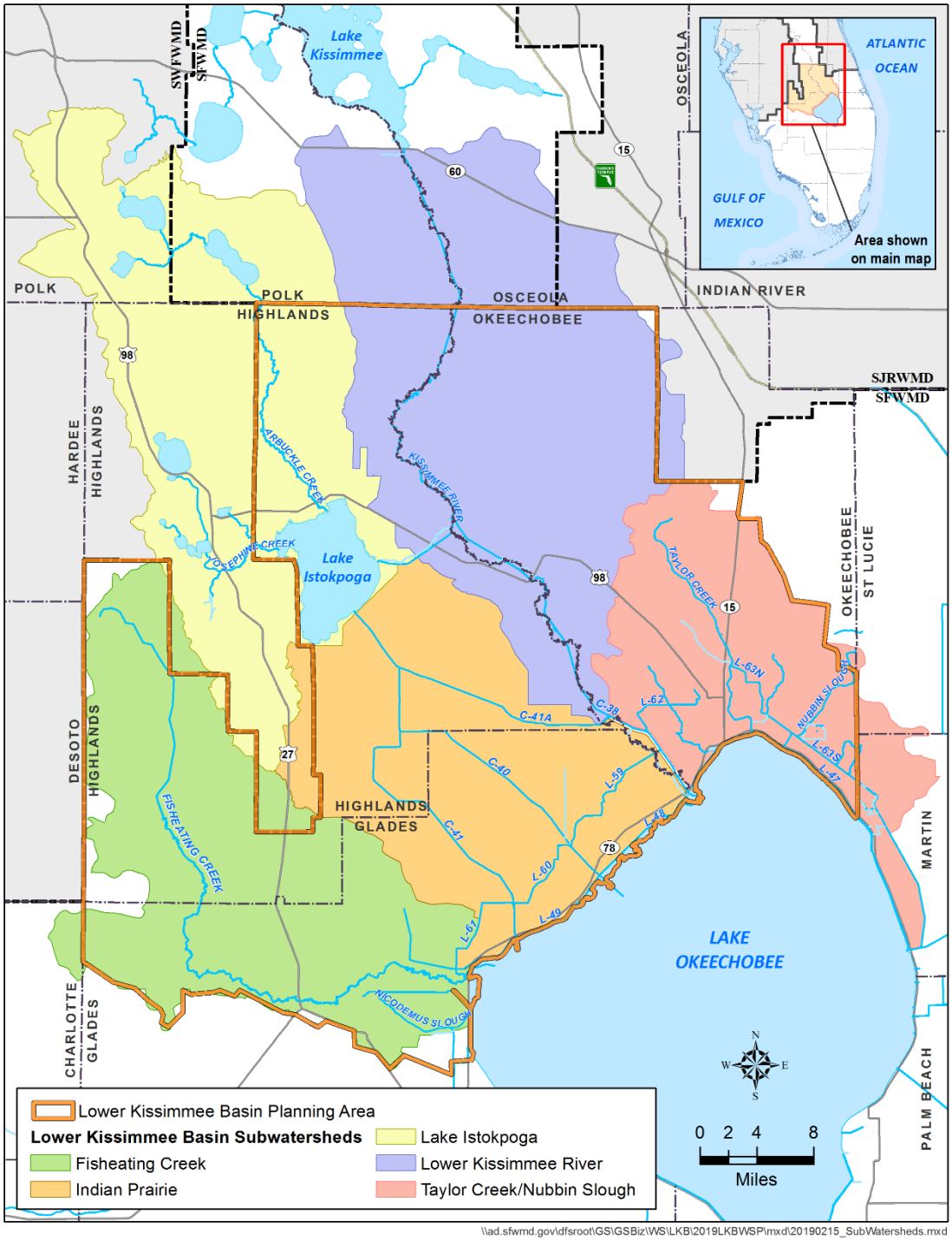

Figure 1-5. Primary subwatersheds within the LKB Planning Area.

Much of the surface water system in the LKB Planning Area was altered to make the land suitable for agriculture and urban settlement, and to provide flood protection. Land use in the region is predominantly agriculture, particularly irrigated pasture, citrus, and sugarcane (**Figure 1-6**). There are approximately 119,000 acres of irrigated agricultural land within the LKB Planning Area. The current (2017) estimated regional population is 52,496 permanent residents, mostly clustered in small urban areas. With annual precipitation typically between 45 and 50 inches and 64 percent of rainfall occurring from June through October, the region depends on the Central and Southern Florida Flood Control Project (C&SF Project) for flood control and other purposes.

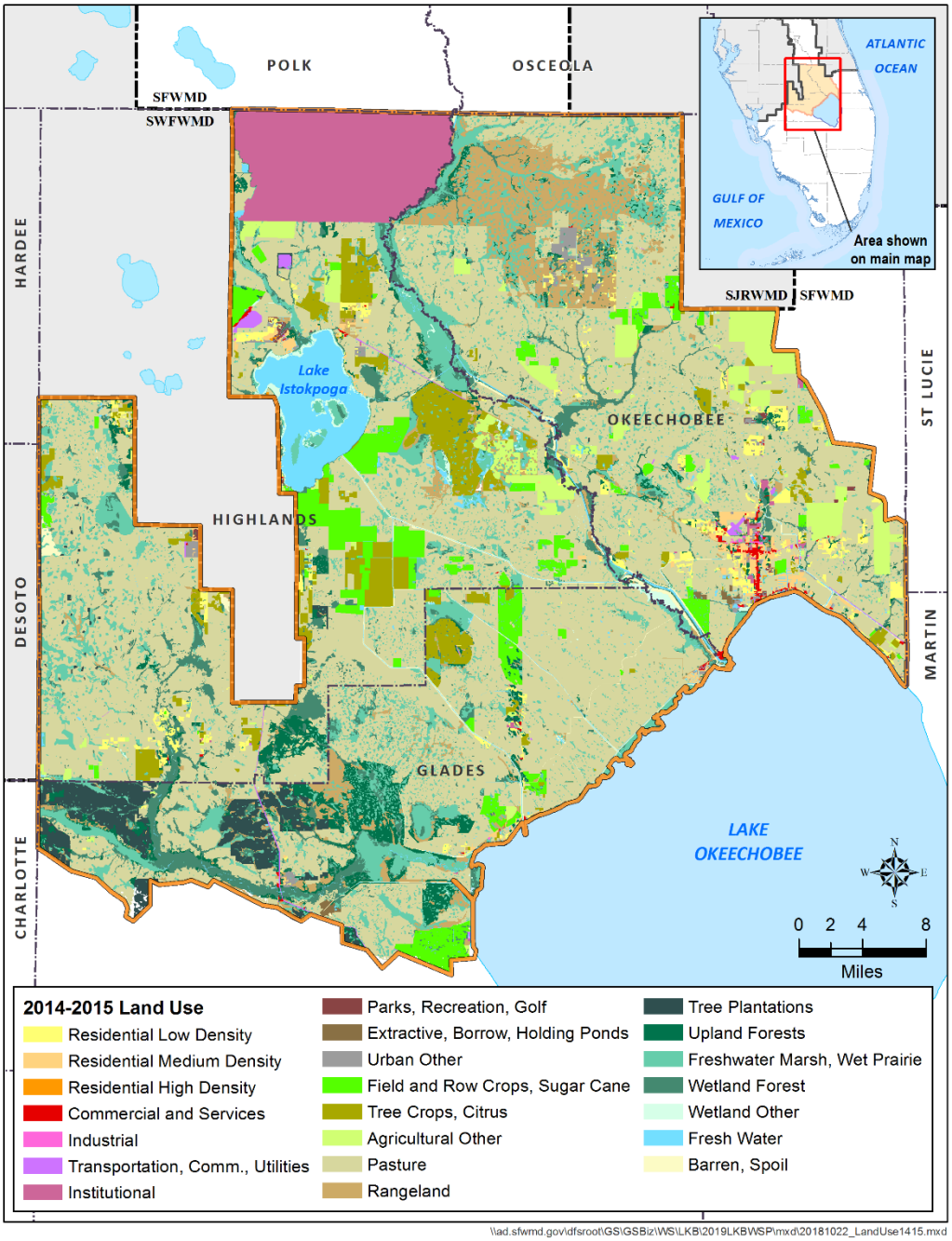

Figure 1-6. Land use in the LKB Planning Area.

The C&SF Project is a complete system of canals, storage areas, and water control structures spanning from the Upper Chain of Lakes in the Orlando area south through Lake Okeechobee and into the Everglades (**Figure 1-7**). The project was designed and constructed during the 1950s and 1960s by the United States Army Corps of Engineers (USACE) to provide flood control and to improve navigation and recreation. Most of the water bodies within the C&SF Project have specific regulation schedules that are federally mandated by the USACE. In its capacity as the local sponsor, the SFWMD operates and maintains portions of the C&SF Project. Operation of the project includes moving water out of certain water bodies to provide flood protection when stages are above the regulation schedule and into certain water bodies for water supply during dry periods.

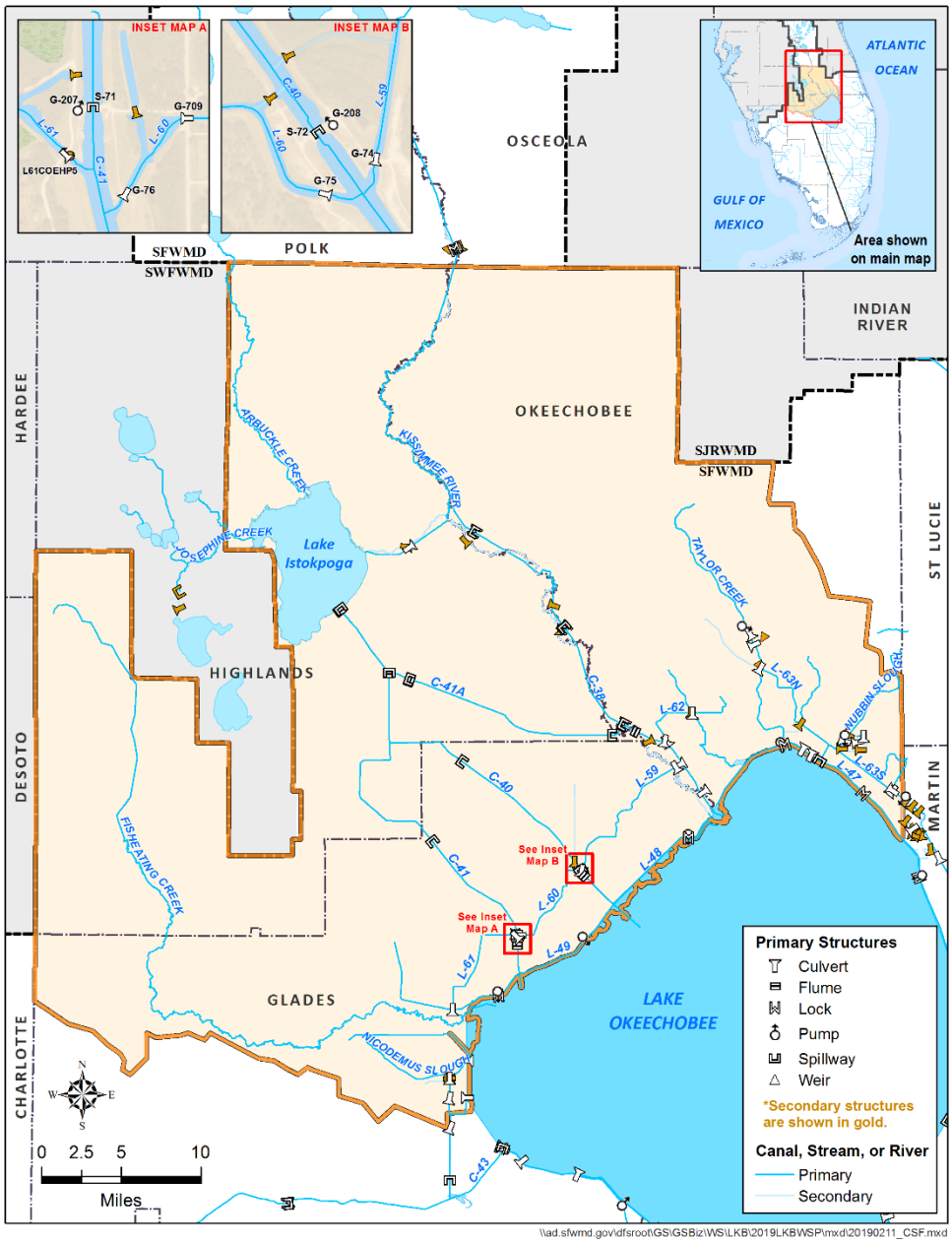

Figure 1-7. Central and Southern Florida Flood Control Project (C&SF Project) canal and structure system components within the LKB Planning Area.

WATER RESOURCES OVERVIEW

Determining the availability of water needed to meet projected demand requires consideration of the area's available water resources. The primary sources of fresh water throughout the LKB Planning Area are surface water and groundwater. To a much lesser extent, reclaimed water also is used. Surface water resources in the LKB Planning Area include lakes, rivers, springs, and canals. Major surface water resources include Lake Istokpoga and its associated canals in the Indian Prairie Basin, Lake Okeechobee and its hydraulically connected water bodies, and the Kissimmee River. Also discussed in this plan update are Taylor Creek/Nubbin Slough and Fisheating Creek, which drain into Lake Okeechobee. Groundwater resources include the surficial and Floridan aquifer systems (SAS and FAS). Further information about water source options is provided in **Chapter 5**.

PROGRESS SINCE THE 2014 LKB PLAN

Since the 2014 LKB Plan (SFWMD 2014), the following activities and programs have been enhancing the understanding of the LKB Planning Area's water resources, water supply, and natural systems.

Hydrologic Studies and Modeling

- **FAS Monitoring Network** – The SFWMD continues to maintain and update a network of more than 117 FAS monitor wells, 12 of which are within the LKB Planning Area. Water level data from the monitor wells are evaluated to help manage use of the FAS as a water supply source. In addition, water quality sampling and analyses are conducted periodically to observe any trends that might signal overuse of the resource.
- **Hydrogeologic Studies** – Between 2014 and 2018, the SFWMD and its partners completed the following hydrogeologic investigations relevant to the LKB Planning Area:
    - Kissimmee Basin Planning Area SAS testing (Janzen and Collins 2016)
    - Hydrogeologic investigation of the FAS in Glades County (Bennett et al. 2016)
    - Hydrogeologic mapping update for the Lower West Coast, including Glades County (Geddes et al. 2015)
    - Geochemistry of the Upper Floridan aquifer and Avon Park Permeable Zone (Geddes et al. 2018)
- **East Central Florida Transient Expanded (ECFTX) Model** – The East Central Florida Transient groundwater model, originally created in 2006, has undergone recent improvements and expansion, primarily to support the Central Florida Water Initiative. The ECFTX model domain encompasses the width of Florida from the Gulf of Mexico to the Atlantic Ocean and from the Marion-Lake county line to the Highlands-Glades county line, including the majority of the LKB Planning Area. Calibration of the ECFTX model was completed in 2019.

- **CERP Aquifer Storage and Recovery (ASR) Regional Study** – The USACE and SFWMD (2015) published the final Technical Data Report of the CERP ASR Regional Study, documenting more than a decade of scientific and engineering results and serving as a technical guide for considering ASR as part of future Everglades restoration efforts. The study incorporated the results from pilot ASR projects successfully constructed and tested along the Kissimmee River and Hillsboro Canal. The National Research Council (2015) released a peer review of the ASR Regional Study in April 2015, concluding that it "significantly advances understanding of large-scale implementation of ASR in south Florida."

Kissimmee River ASR Facility

- **Indian Prairie Basin Water Quantification** – The SFWMD quantified the total surface water available in the Indian Prairie Basin in 1988 using historical hydrometeorological data and hydrologic modeling of runoff in the basin (SFWMD 1988). In 2016, the SFWMD initiated efforts to reanalyze the surface water availability of District canals and borrow canals in the Indian Prairie Basin. The SFWMD used a water budget approach based on observed data that accounts for discharges into and out of the canals, runoff into and withdrawals from the canals, rainfall, evapotranspiration, and seepage. The quantification effort was undertaken in support of determining the Seminole Tribe of Florida's water entitlement as part of the 1987 Water Rights Compact, which is discussed further in **Chapter 6**. The SFWMD and Seminole Tribe of Florida currently are discussing the draft results of the quantification effort.

Regulatory Protection and Water Quality Efforts

- **Chapter 40E-2, Florida Administrative Code, Consumptive Use 2014 Rule Update** – Rule updates from the statewide Consumptive Use Permit Consistency effort resulted in revisions to the SFWMD water use permitting criteria, which can be found in the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (SFWMD 2015a).
- **Kissimmee River and Chain of Lakes Water Reservations** – In 2014, a Water Reservations rule was developed and two public workshops were held. A draft technical document outlining the SFWMD's technical approach for developing the Water Reservations was developed in 2015 (SFWMD 2015b). Multiple public comments were received in response to the draft rule and technical document. The Water Reservations project was postponed in 2016 due to concerns about impacts to endangered species. The Water Reservations project was reinitiated in 2018, and addressing the public comments received in 2015 and 2016 is ongoing.

- **Lake Okeechobee System Operating Manual –** The USACE initiated development of the new Lake Okeechobee System Operating Manual (LOSOM) in January 2019 with a series of public scoping meetings. LOSOM is a component of the C&SF Project System Operating Plan and, when finalized, will replace the current 2008 Lake Okeechobee Regulation Schedule. Implementation of LOSOM is scheduled to coincide with completion of Herbert Hoover Dike rehabilitation in 2022. The purpose of the LOSOM development effort is to re-evaluate and define operations for the Lake Okeechobee regulation schedule that will consider additional infrastructure that soon will be operational. The USACE also will re-examine opportunities to balance the project purposes for flood control, water supply, recreation, navigation, environmental effects to fish and wildlife, and cultural and recreational resources.

Water Storage, Construction, and Restoration Projects

- **Kissimmee River Restoration Project** – In partnership with the USACE, three of five phases of the Kissimmee River Restoration Project are complete. Work on the final two phases is scheduled to be complete in 2020. The SFWMD is integrating the restoration project with various management strategies for the Kissimmee Basin and Northern Everglades region, including the Kissimmee River and Chain of Lakes Water Reservations, the Lake Okeechobee Watershed Protection Plan, and the CERP Lake Okeechobee Watershed Restoration Project (LOWRP). Upon completion of construction, the Kissimmee River Restoration Project will culminate with implementation of a new regulation schedule, called the Headwaters Revitalization Schedule, to guide operation of the S-65 structure.


Restoration work on the Kissimmee River

- **CERP Lake Okeechobee Watershed Restoration Project** – Planning efforts for the LOWRP were reinitiated in 2016. The purpose of the LOWRP is to improve the ecology of Lake Okeechobee, decrease regulatory releases to the St. Lucie and Caloosahatchee estuaries, restore freshwater wetlands in the watershed, and improve water supply for existing legal water users. The project team identified a Tentatively Selected Plan in May 2019. A revised Draft Project Implementation Report and Environmental Impact Statement was made available for public comment in July 2019 and a draft final version is being prepared for project approval by the SFWMD and USACE.
- **Herbert Hoover Dike/Lake Okeechobee** – In 2007, the USACE designated the Herbert Hoover Dike as a Class I risk, the highest risk for dam failure. The completion of the 21.4-mile Reach 1 cutoff wall, on the southeastern portion of Lake Okeechobee from South Bay to the C-44 Canal, satisfies most of the risk reduction goals. Of 32 culverts slated to be replaced, removed, or abandoned by 2018, 1 has been removed, 8 have been replaced, and 18 replacements are in progress. Rehabilitation of additional sections of the dike is ongoing and planned for completion by 2022 with additional funding.

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2

Demand Estimates and Projections

This chapter summarizes the water demand estimates and projections for the Lower Kissimmee Basin (LKB) Planning Area of the South Florida Water Management District (SFWMD or District) through the planning horizon (2017 to 2040). Estimates and projections are presented by water use category and were developed in coordination with various stakeholder groups, including agriculture, utilities, tribal nations, industry, local governments, and other interested parties. A detailed discussion of data collection and analysis methods is provided in **Appendix B**.

TOPICS

- Water Demand
- Water Use Categories
- Population Estimates and Projections
- Public Water Supply
- Domestic and Small Public Supply
- Agricultural Irrigation
- Industrial/Commercial/Institutional
- Recreational/Landscape Irrigation
- Power Generation
- Summary of Demand Estimates and Projections
- Demand Projections in Perspective

Demands associated with the LKB Planning Area are different from other planning areas because 96 percent of the total demand (2017) is attributable to crop irrigation and other agricultural water needs. In more urbanized planning areas within the District, potable water supply for residential uses accounts for a much larger portion of total demand.

WATER DEMAND

Water demands can be described and analyzed in two ways: gross demand and net demand. Gross demand is the volume of water withdrawn or diverted from a groundwater or surface water source. This definition serves as the basis for water allocations established through water use permits issued by the SFWMD. Net demand refers to the volume of water delivered to end users after accounting for treatment losses and delivery system inefficiencies. For Public Water Supply (PWS) and Domestic and Small Public Supply (DSS), demands commonly are referred to as raw and finished demands rather than gross and net demands, respectively.

This *2019 Lower Kissimmee Basin Water Supply Plan Update* (2019 LKB Plan Update) presents demands for average rainfall and 1-in-10 year drought conditions (**Appendix B**). Section 373.709, Florida Statutes (F.S.), states the level-of-certainty planning goal associated with identifying water demands contained in water supply plans shall be based on meeting demands during 1-in-10 year drought conditions. Although not quantified in this plan, environmental demands are addressed through resource protection criteria (**Chapter 4**).

INFO

Average Rainfall and 1-in-10 Year Drought

An **average rainfall year** is defined as a year having rainfall with a 50 percent probability of being exceeded in any other year.

A **1-in-10 year drought** is defined as a year in which below normal rainfall occurs with a 90 percent probability of being exceeded in any other year. It has an expected return frequency of once in 10 years.

WATER USE CATEGORIES

Water demands for this 2019 LKB Plan Update are estimated in 5-year increments for the following six water use categories established by the Florida Department of Environmental Protection (FDEP) in coordination with the state's water management districts:

- **Public Water Supply (PWS)** – Potable water supplied by water treatment plants with a current allocation of 0.10 million gallons per day (mgd) or greater.
- **Domestic and Small Public Supply (DSS)** – Potable water used by households served by small utilities (less than 0.10 mgd) or self-supplied by private wells.
- **Agricultural Irrigation (AGR)** – Self-supplied water used for commercial crop irrigation, greenhouses, nurseries, livestock watering, pasture, and aquaculture.
- **Industrial/Commercial/Institutional (ICI)** – Self-supplied water associated with the production of goods or provision of services by industrial, commercial, or institutional establishments.
- **Recreational/Landscape Irrigation (REC)** – Self-supplied and reclaimed water used to irrigate golf courses, sports fields, parks, cemeteries, and large common areas such as land managed by homeowners' associations and commercial developments.
- **Power Generation (PWR)** – Self-supplied and reclaimed water used for cooling, potable, and process water by power generation facilities.

Table 2-1 presents estimated (2017) and projected (2040) average gross water demands, by category, in the LKB Planning Area for this water supply plan update. AGR accounts for the vast majority of current and projected demands, followed by PWS, DSS, REC, and ICI. Modest growth is projected for these water use categories through the planning horizon.

Table 2-1. Estimated (2017) and projected (2040) average gross water demands (in mgd) for the LKB Planning Area, by use category.

Water Use Category	2017	2040
Public Water Supply	3.04	3.39
Domestic and Small Public Supply	2.02	2.28
Agricultural Irrigation	237.02	248.14
Industrial/Commercial/Institutional	1.70	1.95
Recreational/Landscape Irrigation	1.64	1.73
Power Generation	0.00	0.00
LKB Planning Area Total	**245.42**	**257.49**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.

POPULATION ESTIMATES AND PROJECTIONS

Population estimates and projections for the LKB Planning Area are used to develop demands for all water use categories except PWR. The Bureau of Economic and Business Research (BEBR) provides population estimates and projections at the county level; however, water supply planning requires projections at the sub-county level to delineate domestic self-supply and utility service area populations for DSS and PWS demands. SFWMD staff determined the current (2017) and likely future (2040) service areas of the PWS utilities in collaboration with utility staff. Detailed sub-county population projections from county planning departments then were assigned to PWS utility service areas and DSS areas. In some cases, modifications were made to service area populations based on information from local land use planning maps and local government Comprehensive Plans (**Appendix A**). Once service area populations were determined, additional adjustments were made so the total county populations for any given year matched the latest set of county population projections from BEBR (Rayer and Wang 2018), in accordance with Section 373.709, F.S. Draft results were provided to PWS utilities to ensure accuracy and obtain agreement with final 2040 population projections for the plan update. **Appendix B** provides further details on the development of population estimates and projections.

NOTE

All population estimates and projections are for permanent residents, as defined by the United States Census. However, the per capita use rate, which is used to calculate water demands, reflects use by seasonal residents as well.

Population Estimate and Projection Results

In 2017, the total estimated population within the LKB Planning Area was 52,496 permanent residents (**Table 2-2**). Medium projections from BEBR indicate the LKB Planning Area population will grow approximately 12 percent from 2017, to 58,662 people in 2040. Approximately 75 percent of the permanent resident population lives in Okeechobee County, particularly in the southern portion of the county. Detailed population projections for PWS utilities and county DSS areas are provided in **Appendix B**.

Table 2-2. Permanent resident population served by PWS and DSS in the LKB Planning Area in 2017 and 2040.

County[1]	2017 Population			2040 Population		
	PWS	DSS	Total	PWS	DSS	Total
Glades[2]	3,484	578	4,062	4,046	672	4,718
Highlands	2,705	6,140	8,845	3,201	6,862	10,063
Okeechobee	24,046	15,543	39,589	26,447	17,434	43,881
LKB Planning Area Total	**30,235**	**22,261**	**52,496**	**33,694**	**24,968**	**58,662**

DSS = Domestic and Small Public Supply; LKB = Lower Kissimmee Basin; PWS = Public Water Supply.

[1] Values listed are only for the areas within the LKB Planning Area boundaries.

[2] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

PUBLIC WATER SUPPLY

The PWS category includes potable water supplied by water treatment plants with a current allocation of 0.10 mgd or greater. Developing PWS demand projections in the LKB Planning Area was a multistep process that included determining PWS utility service area and DSS populations, calculating per capita use rates (PCURs), and projecting future water needs.

NOTE

Perceived discrepancies in table totals are due to rounding.

Per Capita Use Rates

For each PWS utility, a net (finished) water PCUR was developed using past population and finished water data reported to the FDEP. The PCUR for each utility is a 5-year (2013 through 2017) average, calculated by dividing annual net (finished) water volumes by the corresponding service area populations for each year. For PWS demand projections, PCURs were assumed to remain constant through 2040. To calculate gross (raw) demands, the treatment efficiency for each utility, based on treatment process type(s) expected in 2040, was applied as a raw-to-finished ratio. Any demand reductions due to historical conservation practices are implicitly factored into the projections by using the 5-year average PCUR. Future water conservation savings (**Chapter 3**) were not factored into the demand projections used in this plan update due to water savings uncertainties.

PWS service area and water treatment plant maps are provided in **Appendix B**. Utility profiles containing population and finished water use data and projections as well as permitted allocations are provided in **Appendix E**.

PWS Demand Estimates and Projections

Tables 2-3 and **2-4** present PWS gross (raw) and net (finished) water demands, respectively, in 5-year increments by county. The results indicate PWS gross (raw) water demands will increase 12 percent, from 3.04 mgd in 2017 to 3.39 mgd in 2040 under average rainfall conditions. Calculation of 1-in-10 year demand is based only on the outdoor portion of PWS use, and the methodology is explained in **Appendix B**.

Table 2-3. PWS gross (raw) water demands in the LKB Planning Area, by county.

County[1]	Demand – Average Rainfall Conditions (mgd)						2040 1-in-10 Year Demand
	2017	2020	2025	2030	2035	2040	
Glades[2]	0.37	0.39	0.41	0.42	0.43	0.44	0.47
Highlands	0.25	0.25	0.26	0.28	0.28	0.29	0.30
Okeechobee	2.42	2.46	2.52	2.58	2.62	2.66	2.82
LKB Planning Area Total	**3.04**	**3.11**	**3.19**	**3.27**	**3.33**	**3.39**	**3.59**

LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWS = Public Water Supply.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

Table 2-4. PWS net (finished) water demands in the LKB Planning Area, by county.

County[1]	Demand – Average Rainfall Conditions (mgd)						2040 1-in-10 Year Demand
	2017	2020	2025	2030	2035	2040	
Glades[2]	0.35	0.36	0.37	0.38	0.39	0.41	0.43
Highlands	0.25	0.25	0.26	0.28	0.28	0.29	0.30
Okeechobee	2.35	2.4	2.45	2.51	2.55	2.59	2.74
LKB Planning Area Total	**2.95**	**3.01**	**3.09**	**3.17**	**3.23**	**3.28**	**3.48**

LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWS = Public Water Supply.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

DOMESTIC AND SMALL PUBLIC SUPPLY

The DSS category includes potable water used by households that are served by small utilities with current allocations less than 0.10 mgd or that are self-supplied by private wells. Permanent resident populations within DSS areas were developed simultaneously with the PWS population estimates and projections. All permanent residents outside of PWS utility service area boundaries were considered DSS population. Population projection methodology and results are provided in the previous section and further described in **Appendix B**. County PCURs for DSS were established using the median use rates for PWS populations within each county. Demands associated with current and future DSS populations were calculated by multiplying DSS county PCURs by estimated and projected populations. PCURs were assumed to remain constant over the planning horizon.

Table 2-5 contains the LKB Planning Area's DSS demand estimates and projections under average rainfall conditions. The average gross (raw) demands in 2017 were 2.02 mgd for 22,261 permanent residents (**Table 2-2**). DSS demands are expected to increase 13 percent, to 2.28 mgd in 2040 for 24,968 residents.

Table 2-5. DSS gross (raw) water demands in the LKB Planning Area, by county.

County[1]	Demand – Average Rainfall Conditions (mgd)						2040 1-in-10 Year Demand
	2017	2020	2025	2030	2035	2040	
Glades[2]	0.06	0.06	0.06	0.06	0.07	0.07	0.07
Highlands	0.43	0.44	0.46	0.47	0.48	0.49	0.52
Okeechobee	1.53	1.57	1.62	1.66	1.69	1.72	1.83
LKB Planning Area Total	**2.02**	**2.07**	**2.14**	**2.19**	**2.24**	**2.28**	**2.42**

DSS = Domestic and Small Public Supply; LKB = Lower Kissimmee Basin; mgd = million gallons per day.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

AGRICULTURAL IRRIGATION

The AGR category includes self-supplied water used for commercial crop irrigation, nurseries, greenhouses, livestock watering, pasture, and aquaculture. AGR is the largest water use category in the LKB Planning Area, accounting for 237.02 mgd (97 percent) of the region's total estimated water demand in 2017. Agricultural production in the LKB Planning Area is of regional significance, with more than 119,000 acres under irrigation (**Figure 2-1**). The value of all agricultural commodities produced in Glades, Highlands, and Okeechobee counties was $653 million in 2017 (United States Department of Agriculture 2019). Seventeen percent of all cattle and calves in the State of Florida are raised in these three counties.

Agricultural acreage data published by the Florida Department of Agriculture and Consumer Services (FDACS 2018) were used to determine water demands for this 2019 LKB Plan Update. Pursuant to Section 373.709(2)(a), F.S., water management districts are required to consider FDACS water demand projections. Any adjustments or deviations from the projections published by FDACS, "…must be fully described, and the original data must be presented along with the adjusted data." A detailed description of the analyses and adjustments is provided in **Appendix B**.

Agricultural water demand was determined using the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) model (Smajstrla 1990). The FDACS irrigated crop acres, soil types, growing seasons, and irrigation methods were used as input data for the AFSIRS model. AGR demand estimates and projections are based on the commercially grown crop categories in **Table 2-6**, as generally developed by the FDEP and water management districts for use in water supply plans.

Hay and pasture are the predominant agricultural irrigated land use in the LKB Planning Area, encompassing more than 43,000 acres and 81.90 mgd in 2017 (**Table 2-6**). Irrigated hay and pasture are followed by citrus, with more than 38,000 acres and 64.03 mgd of irrigation demand in 2017. Together, these two main crop categories account for 68 percent of the irrigated acreage and 63 percent of water demands under average rainfall conditions.

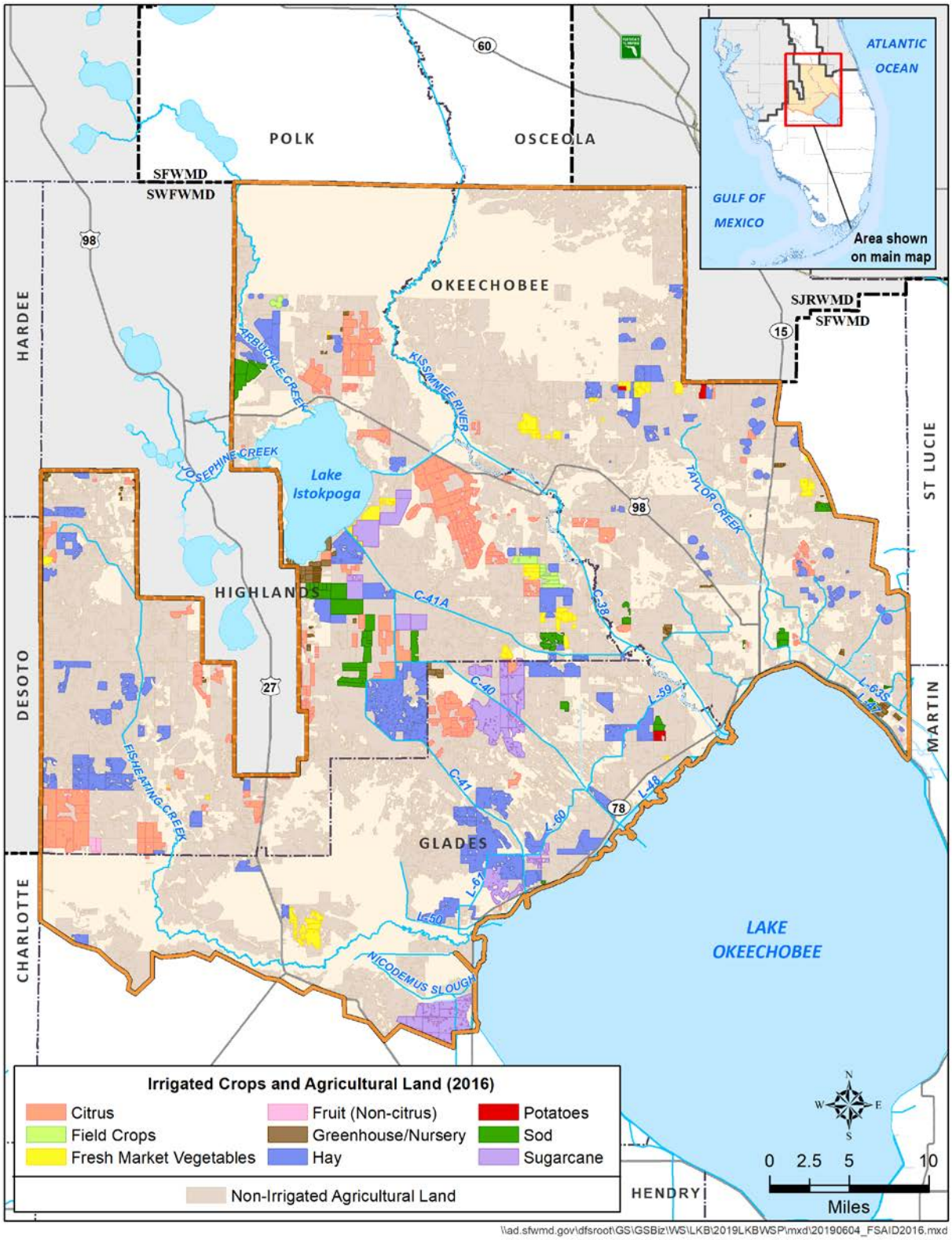

Figure 2-1. Agricultural irrigated land in the LKB Planning Area (Data from: FDACS 2018).

Table 2-6. Agricultural irrigated acres and gross water demands (in mgd) in the LKB Planning Area.

Crop	2017			2040		
	Acres	Average Demand	1-in-10 Year Demand	Acres	Average Demand	1-in-10 Year Demand
Hay/Pasture	43,046	81.90	97.05	37,892	72.71	86.11
Citrus	38,316	64.03	79.22	36,957	62.37	77.04
Sugarcane	17,436	37.82	44.48	21,250	46.40	54.48
Sod	8,677	20.94	24.28	6,674	16.12	18.66
Fresh Market Vegetables	5,047	10.27	11.98	13,384	27.67	32.00
Greenhouse/Nursery	3,353	7.98	8.94	2,912	6.95	7.78
Field Crops	2,175	4.26	5.07	2,634	5.42	6.39
Potatoes	551	1.26	1.47	517	1.20	1.40
Fruit (Non-Citrus)	431	1.03	1.15	900	1.78	2.01
Total	**119,034**	**229.49**	**273.65**	**123,118**	**240.61**	**285.85**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.

Total irrigated acres in the LKB Planning Area are projected to remain relatively stable, growing approximately 3 percent by 2040. Irrigated hay and pasture along with citrus are projected to lose acreage over the planning horizon, likely due to crop conversions. The largest change in irrigated acreage and demands is expected to occur in the fresh market vegetables crop category. By 2040, fresh market vegetable acreage is expected to reach 13,384 acres, an increase of 8,337 acres. Water demands for the fresh market vegetables crop category are projected to more than double, reaching 27.67 mgd by 2040.

INFO

Examples of crop categories used in this report include the following:

Fresh Market Vegetables:

- Tomatoes
- Green beans
- Sweet corn
- Peppers
- Melons

Fruits (Non-Citrus):

- Blueberries
- Strawberries

Total AGR gross water demands under average rainfall conditions in the LKB Planning Area are projected to increase 5 percent, from 237.02 mgd in 2017 to 248.14 mgd in 2040 (**Table 2-7**). These totals include demands from livestock and aquaculture in addition to the demands from crop irrigation shown in **Table 2-6**. Demands for livestock and aquaculture in the LKB Planning Area are estimated to be 6.94 mgd and 0.60 mgd, respectively, in 2017 and are projected to remain steady over the planning horizon.

Table 2-7. AGR gross water demands in the LKB Planning Area, by county.

County[1]	Demand – Average Rainfall Conditions (mgd)						2040 1-in-10 Year Demand
	2017	2020	2025	2030	2035	2040	
Glades[2]	74.02	83.34	92.72	99.41	109.86	117.74	139.09
Highlands	129.07	125.07	119.48	115.09	107.35	103.64	123.19
Okeechobee	33.93	32.90	30.81	30.16	27.42	26.75	31.11
LKB Planning Area Total	**237.02**	**241.31**	**243.01**	**244.66**	**244.63**	**248.14**	**293.39**

AGR = Agricultural Irrigation; LKB = Lower Kissimmee Basin; mgd = million gallons per day.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

Approximately 0.50 mgd of reclaimed water is used for AGR in Okeechobee County (FDEP 2017). No other reclaimed water is used for agricultural purposes within the LKB Planning Area, and no additional use is projected over the planning horizon.

INDUSTRIAL/COMMERCIAL/INSTITUTIONAL

The ICI water use category includes water demands at industrial and commercial facilities. ICI demands only include self-supplied users and do not include industrial or commercial users that receive water from PWS utilities; those users are included in the PWS category. ICI projections assume demands for average rainfall and 1-in-10 year drought conditions are the same and withdrawal demand is equal to user demand. Therefore, no distinction is made between net and gross water demands.

Estimated ICI demands for 2017 were 1.70 mgd, with minimal projected growth resulting in ICI demands of 1.95 mgd in 2040 (**Table 2-8**). Water use associated with mining operations account for approximately 39 percent of ICI demands, while uses such as concrete mixing account for the remaining demand. Growth within the ICI category is expected to be driven by regional population growth.

Table 2-8. ICI water demands in the LKB Planning Area, by county.

County[1]	Demand – Average Rainfall Conditions (mgd)						2040 1-in-10 Year Demand
	2017	2020	2025	2030	2035	2040	
Glades[2]	0.68	0.70	0.73	0.75	0.77	0.79	0.79
Highlands	0.95	0.97	1.01	1.03	1.06	1.08	1.08
Okeechobee	0.07	0.08	0.08	0.08	0.08	0.08	0.08
LKB Planning Area Total	**1.70**	**1.75**	**1.81**	**1.86**	**1.91**	**1.95**	**1.95**

ICI = Industrial/Commercial/Institutional; LKB = Lower Kissimmee Basin; mgd = million gallons per day.

[1] Values listed are only for the areas within the LKB Planning Area boundaries.

[2] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

RECREATIONAL/LANDSCAPE IRRIGATION

Aside from PWR, REC is the smallest water use category in the LKB Planning Area, encompassing irrigation of golf courses and other landscaped areas such as parks, sports fields, and homeowners' association common areas. Demands are calculated using AFSIRS model results only for REC areas with water use permits issued by the SFWMD. Approximately two-thirds of current REC demands are met with surface water, and the remainder is met with groundwater.

There are three types of irrigated landscaped areas outside of those permitted by the SFWMD that are excluded from the REC demands. The first type includes landscaped areas irrigated with potable water provided by PWS utilities. These demands are accounted for under PWS estimates and projections. The second type is irrigated landscaped areas served by individual residential wells permitted by rule [Rule 40E-2.061, Florida Administrative Code] rather than with an individual water use permit. Demands associated with small residential wells are not

quantified as part of this 2019 LKB Plan Update due to the lack of water use and acreage data. The third type of irrigated landscaped areas are those served with reclaimed water that do not require a water use permit. This usually occurs where reclaimed water is used directly from a pressurized pipeline or delivered into a lined lake, where there is no mixing with traditional water sources prior to use. Reclaimed water is a major source for the irrigation of permitted and non-permitted landscaped areas in other planning areas; however, reclaimed water currently is not used or projected to be used for these purposes within the LKB Planning Area.

There are 7 golf courses irrigating 334 acres under water use permits in the LKB Planning Area (**Table 2-9**). Under average rainfall conditions, this land use required an estimated 0.80 mgd in 2017. Golf course acreage and associated water demands are projected to remain steady through 2040.

Within the REC category, 354 permitted acres of land were attributed to landscape irrigation (**Table 2-9**). These landscaped areas are expected to grow at the same rate as the local population through 2040.

Table 2-9. REC acreage and gross water demands (in mgd) in the LKB Planning Area.

Land Use	2017			2040		
	Acres	Average Demand	1-in-10 Year Demand	Acres	Average Demand	1-in-10 Year Demand
Landscape	354	0.84	0.98	394	0.94	1.09
Golf	334	0.80	0.92	334	0.80	0.92
LKB Planning Area Total	**688**	**1.64**	**1.90**	**728**	**1.73**	**2.01**

LKB = Lower Kissimmee Basin; mgd = million gallons per day; REC = Recreational/Landscape Irrigation.

Gross water demands for REC (**Table 2-10**) were calculated by summing demands from the golf sector and the other landscaped areas. Under average rainfall conditions, total estimated REC gross water demands are projected to increase 6 percent, from 1.64 mgd in 2017 to 1.73 mgd in 2040. More than half of REC demands are attributed to Okeechobee County, and the county's majority share is expected to continue through 2040.

Table 2-10. REC gross water demands in the LKB Planning Area, by county.

County[1]	Demand – Average Rainfall Conditions (mgd)						2040 1-in-10 Year Demand
	2017	2020	2025	2030	2035	2040	
Glades[2]	0.00	0.00	0.01	0.01	0.01	0.01	0.01
Highlands	0.63	0.63	0.63	0.64	0.64	0.64	0.74
Okeechobee	1.01	1.02	1.04	1.06	1.08	1.09	1.27
LKB Planning Area Total	**1.64**	**1.66**	**1.68**	**1.70**	**1.72**	**1.73**	**2.01**

LKB = Lower Kissimmee Basin; mgd = million gallons per day; REC = Recreational/Landscape Irrigation.

[1] Values listed are only for the areas within the LKB Planning Area boundaries.

[2] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

POWER GENERATION

Demands under the PWR category include use of groundwater, fresh surface water, or reclaimed water by thermoelectric power generation facilities. There were two power generation facilities discussed in the 2014 LKB Plan (SFWMD 2014): a TECO Energy power station in Highlands County near the City of Sebring; and the Indiantown Cogeneration Plant, which is located in Martin County (part of the SFWMD's Upper East Coast Planning Area) but relies on surface water from the L-63N Canal (Taylor Creek) within the LKB Planning Area. Since the last plan, the TECO Energy facility has permanently closed. The Indiantown Cogeneration Plant, which is operated by Florida Power & Light (FPL), currently is on standby and not using any water. The cogeneration plant is anticipated to remain on standby for the foreseeable future.

The are no power demands estimated for 2017 due to the change in status of the two power generation facilities reported in the 2014 LKB Plan (SFWMD 2014). The power needs of the LKB Planning Area currently are met by facilities located outside of the planning area. There are no new power generation facilities planned. Therefore, PWR demands are projected to remain at 0.00 mgd through 2040.

SUMMARY OF DEMAND ESTIMATES AND PROJECTIONS

Total gross water demands under average rainfall conditions in the LKB Planning Area are projected to be 257.49 mgd by 2040, a 5 percent increase from 2017 demands (245.42 mgd). **Tables 2-11** and **2-12** provide 5-year incremental summaries of gross demands for all water use categories in the LKB Planning Area under average rainfall and 1-in-10 year drought conditions, respectively. Data for 2015 are included for statewide reporting consistency of water supply plan demands to the FDEP. Average annual estimates are used to demonstrate projected trends, including the following key highlights:

- AGR demands account for more than 96 percent of 2017 and 2040 demands in the LKB Planning area. AGR also is the source of more than 90 percent of the demand growth over the planning horizon.
- The combined PWS and DSS demands are expected to increase 12 percent, to 5.67 mgd, by 2040 with the projected population growth of 6,166 permanent residents.
- The demands for all remaining categories (REC, ICI, and PWR) are small and projected to be 3.68 mgd, combined, in 2040.

Table 2-11. Summary of gross water demands under average rainfall conditions in the LKB Planning Area, by water use category.

Water Use Category	Demand – Average Rainfall Conditions (mgd)						
	2015	2017	2020	2025	2030	2035	2040
PWS	2.99	3.04	3.11	3.19	3.27	3.33	3.39
DSS	1.98	2.02	2.07	2.14	2.19	2.24	2.28
AGR	237.02	237.02	241.31	243.01	244.66	244.63	248.14
ICI	1.67	1.70	1.75	1.81	1.86	1.91	1.95
REC	1.63	1.64	1.66	1.68	1.70	1.72	1.73
PWR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**245.29**	**245.42**	**249.90**	**251.84**	**253.69**	**253.83**	**257.49**

AGR = Agricultural Irrigation; DSS = Domestic and Small Public Supply; ICI = Industrial/Commercial/Institutional; LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWR = Power Generation; PWS = Public Water Supply; REC = Recreational/Landscape Irrigation.

Table 2-12. Summary of gross water demands under 1-in-10 year drought conditions in the LKB Planning Area, by water use category.

Water Use Category	Demand – 1-in-10 Year Drought Conditions (mgd)						
	2015	2017	2020	2025	2030	2035	2040
PWS	3.20	3.22	3.30	3.38	3.47	3.53	3.59
DSS	2.11	2.15	2.20	2.27	2.33	2.37	2.42
AGR	281.18	281.18	285.81	287.61	289.72	289.44	293.39
ICI*	1.67	1.70	1.75	1.81	1.86	1.91	1.95
REC	1.89	1.90	1.92	1.95	1.98	1.99	2.01
PWR*	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**290.05**	**290.15**	**294.98**	**297.01**	**299.35**	**299.24**	**303.36**

AGR = Agricultural Irrigation; DSS = Domestic and Small Public Supply; ICI = Industrial/Commercial/Institutional; LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWR = Power Generation; PWS = Public Water Supply; REC = Recreational/Landscape Irrigation.

* Demands for ICI and PWR are the same as for average rainfall conditions.

DEMAND PROJECTIONS IN PERSPECTIVE

Demand projections presented in this 2019 LKB Plan Update are based on the best available information. **Table 2-13** shows the 2035 average gross demands projected in the 2014 LKB Plan compared to the 2040 demands projected in this 2019 LKB Plan Update. The projection for 2040 in this 2019 LKB Plan Update is 16 percent higher than the estimated 2035 demand projected in the 2014 LKB Plan. The projections reflect trends, economic circumstances, and industry intentions that will change over time. In addition, the AGR, ICI, and REC projections presented in this plan update were developed using a different methodology than was used in the 2014 LKB Plan in order to improve accuracy and use the best available data. Like any predictive tool based on past assumptions, there is uncertainty and a margin for error.

Table 2-13. Comparison of gross water demands under average rainfall conditions at the end of the respective planning horizons in the 2014 LKB Plan and this 2019 LKB Plan Update.

Water Use Category	2014 LKB Plan	2019 LKB Plan Update	Percent Difference
	2035 Demand (mgd)	2040 Demand (mgd)	
Public Water Supply	3.4	3.39	0%
Domestic and Small Public Supply	2.6	2.28	-12%
Agricultural Irrigation	185.0	248.14	34%
Industrial/Commercial/Institutional	23.9	1.95	-92%
Power Generation	0.7	0.00	-100%
Recreational/Landscape Irrigation	6.4	1.73	-73%
Total	**222.0**	**257.49**	**16%**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.

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3

Demand Management: Water Conservation

Demand management through water conservation is an important element of water supply planning and involves reducing the quantity of water required to meet regional demands through efficiency improvements and the prevention or reduction of unnecessary uses or losses of water. Water conservation contributes to the sustainability of water supply resources. Section 373.709(2), Florida Statutes (F.S.), requires that water conservation be considered when determining if the total capacity of the water supply development project options included in a water supply plan exceed the increase in projected demands for the planning horizon.

TOPICS

- Comprehensive Water Conservation Program
- Conservation Strategies
- Conservation Programs
- Potential for Water Conservation Savings
- Summary of Water Conservation

All water sources are finite; therefore, conservation and efficiency measures should be maximized, regardless of the source, before more costly development options are implemented. Water conservation can reduce, defer, or eliminate the need to develop new water supply sources to meet current or future demands, which has the same effect as expanding the existing water supply. Moreover, conservation and demand management have been shown to reduce costs to utilities and rate payers over the long term (Feinglas et al. 2013, Chesnutt et al. 2018). Improving water use efficiency can reduce operational costs (e.g., lower water utility bills, lower costs to heat or move water) for most other users as well.

This chapter describes water conservation strategies and programs available to water users in the Lower Kissimmee Basin (LKB) Planning Area of the South Florida Water Management District (SFWMD or District). Where applicable, an estimate of potential water savings achievable in the LKB Planning Area by 2040 is provided. Supporting information such as conservation initiatives, measures and programs by user type, and education and outreach materials can be found in the *2016 Water Supply Plan Support Document* (Support Document; SFWMD 2016).

COMPREHENSIVE WATER CONSERVATION PROGRAM

The SFWMD's Comprehensive Water Conservation Program was approved by the District Governing Board in 2008 and covers all SFWMD planning areas. The goal of this District-driven program is to achieve a measurable reduction in water use; inspire governments, citizens, and businesses to value and embrace a conservation ethic; and serve as a model for water conservation (SFWMD 2008). This program is independent from the consumptive use permitting process and is subject to funding levels and voluntary participation by Public Water Supply (PWS) utilities, local municipalities, and other water users. The SFWMD's conservation program is more fully described in the Support Document (SFWMD 2016) and on the SFWMD website (www.sfwmd.gov/conserve).

CONSERVATION STRATEGIES

Water conservation strategies guide and support implementation of conservation programs that target specific user groups. Per capita water use demand reduction has occurred gradually across the country since the 1980s, largely because of passive savings. Passive water savings are a result of the introduction of water-efficient fixtures and appliances into the marketplace via national and local ordinances and through the natural replacement of existing water-using devices with more water-efficient models. However, relying on passive savings alone would delay or ignore substantial conservation savings potential. Therefore, many local governments, utilities, and state agencies use conservation strategies to increase water use efficiency among specific user groups.

Water use efficiency and conservation measures are actions that encourage use of high-efficiency equipment or improved water use behaviors that yield water savings. Local and tribal governments, utilities, and large water users are encouraged to research cost-share funding and other collaborative opportunities (discussed later in this chapter) to help implement conservation strategies and programs. The following sections briefly describe conservation opportunities, strategies, and measures specific to the six water use categories addressed in this water supply plan update.

Agricultural Irrigation

Agricultural Irrigation (AGR) is the largest water use category in the LKB Planning Area, accounting for 248.14 million gallons per day (mgd), or 96.4 percent of the total 2040 projected demand for the region. Therefore, local and regional efforts to increase water conservation implementation in this planning area should focus on this user group, which includes row and field crops, aquaculture, orchards, nurseries, and livestock operations.

AGR efficiency can be improved by replacing outdated or inefficient irrigation systems with newer, more efficient ones. The selection of a more efficient system depends on the crop type, soil composition, water source, and water availability. In 2040, the LKB Planning Area is projected to contain approximately 70,122 acres of crops irrigated using flood seepage and 1,288 acres of nursery irrigated using methods other than low-volume systems (e.g., drip systems). Substantial efficiency gains, resulting in lower water use, could be made by converting less efficient systems, where economically and technically feasible, to more efficient ones.

In addition to converting to more efficient irrigation systems, many AGR operations can benefit from optimizing the operation, management, and maintenance of existing irrigation systems. Regulating irrigation scheduling (e.g., time between irrigation events, amount of water applied) based on crop needs, soil conditions, and weather can improve irrigation water use efficiency. Precision irrigation, using devices such as soil moisture sensors, automated pump controls, and weather-sensing devices, can improve agricultural irrigation scheduling, including operations currently using efficient irrigation delivery systems.

Because the costs associated with moving water affect profitability, most agricultural operations presumably are as efficient as practical with their existing irrigation systems and growing methods. Also, profit margins may limit growers' ability to transition to new irrigation systems or methods. Growers are encouraged to investigate the feasibility of self-funding and/or seek financial assistance through cost-share programs or other sources of funding, which are discussed later in this chapter.

Implementation of tailwater recovery—capturing and recycling water that runs off a field—can offset some demand. However, this does not affect the water use efficiency (i.e., reduce the demand) of the affected operations and, therefore, is not addressed in this chapter.

Recreational/Landscape Irrigation

The Recreational/Landscape Irrigation (REC) use category includes self-supplied irrigation water at parks, athletic fields, golf courses, landscaped areas (e.g., homeowners' association common areas, greenspace at commercial centers and office buildings), roadway medians, and cemeteries. In 2040, there are projected to be 728 irrigated acres in the LKB Planning Area under the REC category, accounting for 1.73 mgd in demand.

All REC users are required to develop a conservation program to meet the regulatory criteria found in Section 2.3.2 of the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (SFWMD 2015) to receive a water use permit from the SFWMD. In general, the requirements are to use Florida-Friendly Landscaping™ principles, including the use of rain sensors or other devices to override irrigation systems when adequate rainfall has occurred (also required by Section 373.62, F.S.), and to limit irrigation to the hours and/or days specified in Chapter 40E-24, Florida Administrative Code (F.A.C.) (the Mandatory Year-Round Landscape Irrigation Conservation Measures Rule).

Rain Sensor

Irrigation systems using smart controllers (computerized controllers that use precision irrigation methods to calculate evapotranspiration or soil moisture-based controllers) can achieve savings beyond those achieved through the use of rain sensors and simple timer-based irrigation control systems. An estimated 30 to 40 percent reduction in water use can be achieved with weather-based controllers in residential settings if they are properly installed and programmed (Water Research Foundation 2016). Savings in non-residential applications are anticipated but have not been determined.

There currently are 7 permitted golf courses, covering 334 irrigated acres, within the LKB Planning Area. These users account for 0.80 mgd (49 percent) of the total REC demand. Acres and demands are projected to remain unchanged over the planning horizon. Golf courses typically have a high degree of water use efficiency; however, opportunities to improve efficiency may exist. The Golf Course Superintendents Association of America (2007) published best management practices (BMPs) for golf course managers, with many BMPs focused on efficient water use.

Industrial/Commercial/Institutional

From a water conservation standpoint, Industrial/Commercial/Institutional (ICI) water use includes users in office buildings, industrial facilities, restaurants, movie theaters, long-term care facilities, and hospitals. This definition is slightly different from that used to classify some of these users in the permitting process. These users typically receive water from public suppliers; however, some may receive publicly supplied water for domestic uses and self-supply for other uses (e.g., landscape irrigation, industrial processes). Larger users outside a public supplier service boundary are more likely to be self-supplied. Conservation strategies for these users can target both indoor and outdoor water use.

Self-supplied industrial water users encompass a wide variety of activities, including process water in industrial plants, dust suppression, some areas of agricultural production, and commodity manufacturing. In the LKB Planning Area, the ICI use category accounts for 1.95 mgd (0.8 percent) of the total 2040 projected demand. There are recognition programs applicable to ICI users, and funding may be available to users making efficiency upgrades to their facilities that would result in water savings.

Common water efficiency improvement measures ICI users can implement are outlined in the SFWMD's (2013) Water Efficiency Audit Guide, which is discussed in greater detail in the Support Document (SFWMD 2016). Other measures for improving efficiency may be applicable to specific ICI operations or facilities such as autoclaves in hospitals; food steamers in restaurants; heating, ventilation, and air conditioning (HVAC) system efficiency upgrades; process water use in manufacturing plants; and water-cooling devices.

Public Water Supply

PWS in the LKB Planning Area accounts for a small portion (3.39 mgd; 1.3 percent) of the region's 2040 projected demands. Water users served by the Okeechobee Utility Authority, the largest PWS supplier in the region, use approximately 99 gallons per capita per day, which is considerably lower than most of South Florida (presumably due to less residential use of potable water for lawn and landscape irrigation). Because of the low regional PWS demand, conservation information for this use category is abbreviated in this plan update.

Even with low demand, there may be opportunities for conservation savings among PWS users in the LKB Planning Area. PWS conservation strategies could include programs to replace older, less efficient indoor plumbing fixtures and appliances in existing residential and commercial buildings through rebates or other incentive mechanisms. For new construction, utilities and local governments could mandate through ordinance or provide rebates to incentivize water-efficient construction standards. The Florida Water Star^{SM} program (described later in this chapter) could provide a pre-packaged framework for such an effort.

Domestic and Small Public Supply

The 2040 demand for Domestic and Small Public Supply (DSS) in the LKB Planning Area is projected to be 2.28 mgd (0.9 percent) of total regional demand. This use category includes mostly residential users withdrawing water from surficial aquifer system wells for domestic and irrigation needs. Indoor and outdoor water conservation strategies available to residential and commercial users supplied by PWS utilities are applicable to DSS users also. Potential strategies include replacing old plumbing fixtures and water-using appliances with water-efficient models; detecting and repairing household water leaks; and installing smart irrigation devices. Local and tribal governments are encouraged to conduct educational outreach to promote and incentivize water conservation among DSS users.

Power Generation

As of 2019, there is no direct water demand for power generation within the LKB Planning Area. One of the two facilities mentioned in the 2014 LKB Plan (SFWMD 2014), a TECO Energy power station in Highlands County near the City of Sebring, has permanently closed. The other power station, the Indiantown Cogeneration Plant, operated by Florida Power & Light, currently is on standby and not using any water. The cogeneration plant is anticipated to remain on standby for the foreseeable future. With demands expected to remain at 0.00 mgd through the planning horizon, the conservation potential is also zero.

CONSERVATION PROGRAMS

Conservation programs should be used to educate water users and facilitate adoption of effective water conservation measures by specific user groups. Conservation measures can be actions or hardware that improve water efficiency. PWS utilities and local governments are the primary entities that typically develop conservation programs. Because PWS makes up a small percentage of demand in the LKB Planning Area, other agencies may assume a leadership role in promoting water conservation at the local, regional, and state level.

The following subsections contain brief descriptions of established conservation programs that may be applicable to different water use categories. A single program or a combination of these can be part of a robust conservation strategy. The design and selection of conservation programs depends on the target group and is directed by a conservation strategy created to effectively reach that group.

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP), implemented through the United States Department of Agriculture – Natural Resources Conservation Service, promotes agricultural production and environmental quality. Financial and technical assistance is offered to voluntary participants to install or implement structural and management practices that address impaired water quality and conservation of water resources on eligible agricultural land. From Fiscal Year (FY) 2012 through FY2017, 47 irrigation efficiency projects were funded by EQIP in the LKB Planning Area. Sixteen projects were in Glades County, 19 in Highlands County, and 12 in Okeechobee County. These projects have affected 19,156 acres, 29,725 acres, and 932 acres in those counties, respectively. EQIP is expected to continue, although future funding levels are uncertain.

Agricultural Best Management Practices Program

The Florida Department of Agriculture and Consumer Services (FDACS) develops and adopts agricultural BMPs by rule for different types of agricultural operations. These BMPs have been designed primarily to reduce negative impacts on water quality while maintaining or enhancing agricultural production. However, some BMPs (e.g., aquaculture, citrus, dairy, nurseries, sod, specialty fruit and nut crops, vegetable and agronomic crops) also improve water use efficiency and could reduce the amount of water needed to meet crop demands in average to wet years. The Lake Okeechobee Basin Management Action Plan, which covers much of the LKB Planning Area, requires agriculture producers to implement FDACS-adopted BMPs or conduct water quality monitoring. All agricultural water users are encouraged to enroll in the FDACS BMP program (FDACS 2019a).

INFO

Examples of agronomic crops include the following:

- Grains
- Legumes
- Sugarcane
- Tubers
- Pasture

Agricultural Mobile Irrigation Labs

The Mobile Irrigation Lab program performs free evaluations of irrigation system efficiency and make recommendations for physical and operational improvements. Such recommendations may include modification of irrigation systems and equipment, alteration of irrigation scheduling, and other aspects of system management. Presently, the Highlands Soil and Water Conservation District serves Highlands County, the St. Lucie Mobile Irrigation Lab serves Okeechobee County, and the Collier Soil and Water Conservation District serves Glades County (FDACS 2019b).

Florida Automated Weather Network

The Florida Automated Weather Network, operated by the University of Florida Institute of Food and Agricultural Sciences, provides weather information throughout the state at 15-minute intervals. Florida Automated Weather Network management tools provide decision support functions to growers using historical weather data and crop modeling technology to help with short- and long-term planning, thereby maximizing the efficiency of irrigation practices (University of Florida Institute of Food and Agricultural Sciences 2019).

Education, Outreach, and Marketing

Education, outreach, and marketing are essential to reducing water use and instilling a lasting conservation ethic in businesses and communities. Although water savings attributed to educational campaigns are difficult to quantify, these campaigns are considered vital to a successful conservation program and behavioral adoption among users. Campaigns usually are designed to reach a specific user group or subgroup (e.g., residents, schools, commercial properties).

Cost-Share Funding Programs

For nearly two decades, the SFWMD has provided funding to local governments, special districts, utilities, homeowners' associations, water users, and other public and private organizations for stormwater management, alternative water supply, and water conservation projects that are consistent with the District's core mission. In FY2016, stormwater management, alternative water supply, and water conservation cost-share programs were combined under the Cooperative Funding Program (CFP). The CFP combines these funding programs into one streamlined program to provide partnership opportunities and financial incentives to implement local projects that complement regional flood control, environmental restoration, water quality, and water supply efforts. The CFP is open to local governments and utilities, homeowners' associations, commercial entities, and agricultural operations for technology and hardware-based water conservation programs. Funding for the CFP is considered annually during the SFWMD's budget development. From FY2014 to FY2019, the SFWMD provided more than $8.18 million in alternative water supply funding for 23 projects and nearly $1.50 million in water conservation funding for 46 projects Districtwide. In the LKB Planning Area, no alternative water supply projects have been proposed since 2009 and no water conservation projects have been funded since 2006 (one project was proposed in 2010 but was ineligible for funding). Additional information regarding the CFP can be found on the SFWMD's website (www.sfwmd.gov; Search: Cooperative Funding Program).

Other funding programs, such as EQIP (discussed earlier), may be available to specific user groups and should be investigated by agencies, local governments, and end users for applicability to their target water use type.

Certification and Recognition Programs

There are several national and statewide certification and recognition programs that direct builders, property owners, and building managers toward meeting environmentally friendly standards. Such programs include the Florida Green Building Coalition's Green Certification Program, the Florida Green Lodging Program, Leadership in Energy and Environmental Design (LEED), and Green Globes. These holistic programs typically include criteria affecting water use, energy efficiency, climate-adaptive landscaping, sustainable building material, site selection, indoor environmental quality, and greenhouse gas emissions.

In addition, there are single-focus programs that target one area of impact and often are less expensive for builders and property managers. Two single-focus programs endorsed by all water management districts in Florida are Florida Water Star℠ and Florida-Friendly Yard Recognition™. The Florida Water Star℠ program certifies buildings and associated outdoor spaces that have been designed or retrofitted to meet high water-efficiency standards and offers training for landscape and irrigation professionals to obtain program accreditation. The Florida-Friendly Yard Recognition™ program promotes low-maintenance and drought-tolerant plants, environmentally sustainable landscaping, and high-efficiency irrigation practices by providing recognition

Florida Water Star

to properties where Florida-Friendly Landscaping™ practices have been successfully implemented. More information on these programs can be found on their individual program webpages and on the SFWMD's water conservation webpage (www.sfwmd.gov/conserve).

Regulatory Initiatives

Regulations or mandates can be used to implement improved practices or devices into mainstream use. Conservation-related ordinances that local governments can adopt include those requiring greater water efficiency in construction, such as the International Green Construction Code and standards derived from the Florida Water Star℠ program and Florida Green Building Coalition. Ordinances and codes can be adopted wholly or partially, depending on conditions within a service area. Regulations, mandates, or ordinances can be adopted statewide, by statute; by local governments, by ordinance; or by water management districts, by rule. In addition, PWS utilities may be able to require that builders meet efficiency codes in new construction as a condition of service.

The SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule [Chapter 40E-24, F.A.C.] limits landscape irrigation to 2 days a week per week in Okeechobee and Highlands counties and 3 days per week in Glades County. This rule applies to all users, with the exception of permitted agricultural operations, and to all sources of water (e.g., utility, lake, pond, canal, well) except reclaimed water. Provisions for new landscaping and other situations exist, with some limitations. Local governments may adopt more stringent alternative landscape irrigation ordinances based on local water demands, system limitations, or resource availability. Additional information on watering restrictions is available on the SFWMD's water conservation webpage (www.sfwmd.gov/conserve) and in the Support Document (SFWMD 2016).

POTENTIAL FOR WATER CONSERVATION SAVINGS

Agricultural Water Conservation Potential

As stated earlier, AGR is the largest use category in the LKB Planning Area (96.4 percent of the total 2040 projected demand). The amount of potential agricultural conservation savings within the LKB Planning Area was determined using the Florida Statewide Agricultural Irrigation Demand (FSAID) geodatabase (an online user interface that is available at www.fdacs-fsaid.com). Estimated efficiency improvement (i.e., conservation estimate) is one of the parameters calculated by the FSAID model, and the spatially based data are available for water management district planning basins. According to the 2018 FSAID report (FSAID V), "improved efficiencies in irrigation technology and management practices have slowed the rate of agricultural water use" (FDACS 2018).

The FSAID statewide methodology for calculating the amount of potential agricultural conservation savings is more fully described in Appendix E of the FSAID V report (FDACS 2018), but generally is based on the United States Department of Agriculture's Farm and Ranch Irrigation Surveys. Agricultural water use is based on several site-specific parameters, including crop type, acreage, soil type, evapotranspiration, and rainfall. Conservation savings can be achieved through more efficient irrigation and planting methods as well as other irrigation management strategies. The selection of new irrigation systems and management strategies depends on crop type, water source, food safety requirements, and water availability. Financial incentives may be necessary to help agricultural operations transition

to more efficient irrigation systems. The volume of water that could be conserved for an individual project varies depending on the number and magnitude of parameters targeted for change. Using the FSAID statewide methodology, the accuracy of the projected conservation savings for a specific water supply planning area depends on the region's similarities to the Farm and Ranch Irrigation Survey data (e.g., crop mix, existing irrigation systems, soil types, economic feasibility, financial incentives). From 1978 to 2013, agricultural operations in Florida that participated in the survey reduced the amount of water used by an average of 5,500 gallons per acre per year, primarily based on irrigation system changes. From 2003 to 2013, the survey data show efficiency improvements of approximately 2,800 gallons per acre per year, due primarily to changes in scheduling and sensor-based automation. Recognizing lower savings in the more recent survey data, FDACS estimates the average water savings through 2040 to be 2,600 gallons per acre per year for currently irrigated operations not using drip or micro-sprinkler irrigation systems, and 2,300 gallons per acre per year for newly irrigated fields or those irrigating with drip or micro-sprinkler systems.

The total savings calculated by the FSAID model for any given year depends on the crops being produced, the acreage of each crop, and the irrigation systems being employed, as projected to exist in that year. Because these variables change over the planning horizon, the projected savings also change and may be non-linear. Based on data available in 2018 (FSAID V), the estimated conservation potential for the LKB Planning Area in 2040 is 16.73 mgd (8.70 mgd in Glades County, 6.83 mgd in Highlands County, and 1.19 mgd in Okeechobee County). Future versions of the FSAID report may include different estimates of conservation potential based on new variables and projections. After completion of data analysis for this water supply plan update, the FSAID VI report (FDACS 2019c) estimated lower conservation potential.

Water Conservation Potential for Other Use Categories


Xeriscaping

All non-agricultural use categories combined are projected to account for 9.35 mgd of demand in 2040, just 3.6 percent of all water use in the LKB Planning Area. Of this, PWS accounts for the highest portion (3.39 mgd; 1.3 percent) of use. DSS demands are 2.28 mgd (0.9 percent) of total use. The 2040 projected PWS and DSS demands are atypically low compared to the other SFWMD planning areas. Additionally, the per capita use rate for residential users is much lower compared to other similar users in the District, presumably due to less residential use of potable water for lawn and landscape irrigation. Given the relatively low non-agriculture water demands and data availability, a potential water savings of 0.10 mgd was assumed for these water use categories. This assumes a conservative volumetric savings of 10 percent (of demand) at a 10 percent participation rate. REC users account for 1.73 mgd (0.7 percent) of the total 2040 projected demand, while the ICI use category accounts for 1.95 mgd (0.8 percent). As with PWS and DSS, estimates of potential water savings for those users were not calculated.

SUMMARY OF WATER CONSERVATION

AGR is the largest water use category in the LKB Planning Area. FDACS, through the FSAID V model, projected 16.73 mgd of water could be conserved in 2040 through irrigation efficiency and scheduling improvements. Greater conservation savings may be possible if additional measures are implemented or if increased participation rates are realized, which can be facilitated through education programs and other assistance opportunities. Agricultural operations are encouraged to take advantage of the FDACS BMP program as well as funding opportunities (through EQIP or CFP), site audits via mobile irrigation labs, and the Florida Automated Weather Network to make weather-based irrigation decisions. Water use by all non-agricultural use categories in the LKB Planning Area is atypically low compared to other SFWMD planning areas. Savings for these users have been estimated, conservatively, to be 0.10 mgd.

Local, regional, and state government agencies as well as PWS utilities in the LKB Planning Area can develop conservation strategies to encourage and assist water users to improve water use efficiency. Because PWS utilities typically promote conservation only within their service areas, government agencies should consider conducting educational outreach to promote and incentivize conservation among DSS users. Cost-share funding may be available to local governments and, in some cases, directly to large users. Individual users are encouraged to seek out funding and other resources to improve water use efficiency and reduce operational expenses.

SFWMD staff are available to assist conservation program developers in the LKB Planning Area with technical support, collaborative program implementation, ordinance review, long-term demand management planning, and funding assistance via the District's CFP. In addition to the programs and strategies discussed in this chapter, conservation program resources are discussed further in the Support Document (SFWMD 2016).

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4

Water Resource Protection

This chapter provides an overview of protections afforded to water resources in the Lower Kissimmee Basin (LKB) Planning Area of the South Florida Water Management District (SFWMD or District) through statutory and regulatory criteria. The ability to meet water demands described in **Chapter 2** largely depends on the future availability of water resources. Understanding the relationship between projected water demands, water sources, and limitations imposed on withdrawals is critical to water supply planning.

TOPICS

- Regulatory Protection of Water Resources
- Summary of Water Resource Protection

The LKB Planning Area relies on surface water from Lake Istokpoga and Lake Okeechobee and their connected canals, the Kissimmee River, and fresh groundwater from the surficial and Floridan aquifer systems as the primary water sources for urban, agricultural, and industrial uses. However, rules have been adopted for Lake Istokpoga and Lake Okeechobee that limit new or increased allocations beyond existing volumes. Many water users in the region have constructed wells to use groundwater as a supplemental water supply to surface water.

NOTE

MFLs and recovery and prevention strategies for Lake Okeechobee and the Lower West Coast aquifers affect portions of the LKB Planning Area but are included in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018) and *2017 Lower West Coast Water Supply Plan Update* (SFWMD 2017), respectively.

Measures adopted by the SFWMD to protect water resources in the LKB Planning Area include Minimum Flows and Minimum Water Levels (MFLs), Water Reservations, and Restricted Allocation Areas (RAAs). Between 2001 and 2006, MFLs were adopted for Lake Istokpoga, Lake Okeechobee, and the Lower West Coast aquifers. Water Reservations for the protection of fish and wildlife are being developed for the Kissimmee River and floodplain, Headwaters Revitalization Lakes, and Upper Chain of Lakes. RAAs were established for the Lake Istokpoga/Indian Prairie Canal System in 1981 and the Lake Okeechobee Service Area (LOSA) in 2008.

The interaction between science, policy, and legal tools as well as water use regulatory programs protect water supplies for natural systems. Water use permit applicants must provide reasonable assurances that the proposed water use 1) is reasonable-beneficial, 2) will not interfere with any existing legal use of water, and 3) is consistent with the public interest [Section 373.223(1), Florida Statutes, (F.S.)]. This chapter describes water use permitting criteria, MFL criteria, Water Reservations, RAAs, and water shortage plans designed to protect and manage water resources.

REGULATORY PROTECTION OF WATER RESOURCES

The intent of Chapter 373, F.S., is to promote the availability of sufficient water for all existing and future reasonable-beneficial uses and natural systems [Section 373.016(3)(d), F.S.]. The SFWMD developed water resource protection standards consistent with legislative direction that are implemented to prevent various levels of harm (no harm, harm, significant harm, and serious harm). Each standard plays a role in achieving sustainable water resources. For instance, programs regulating water use permitting must prevent harm to the water resource, including related natural systems. **Figure 4-1** represents the conceptual relationship among water resource protection standards, associated conditions, and water shortage severity.

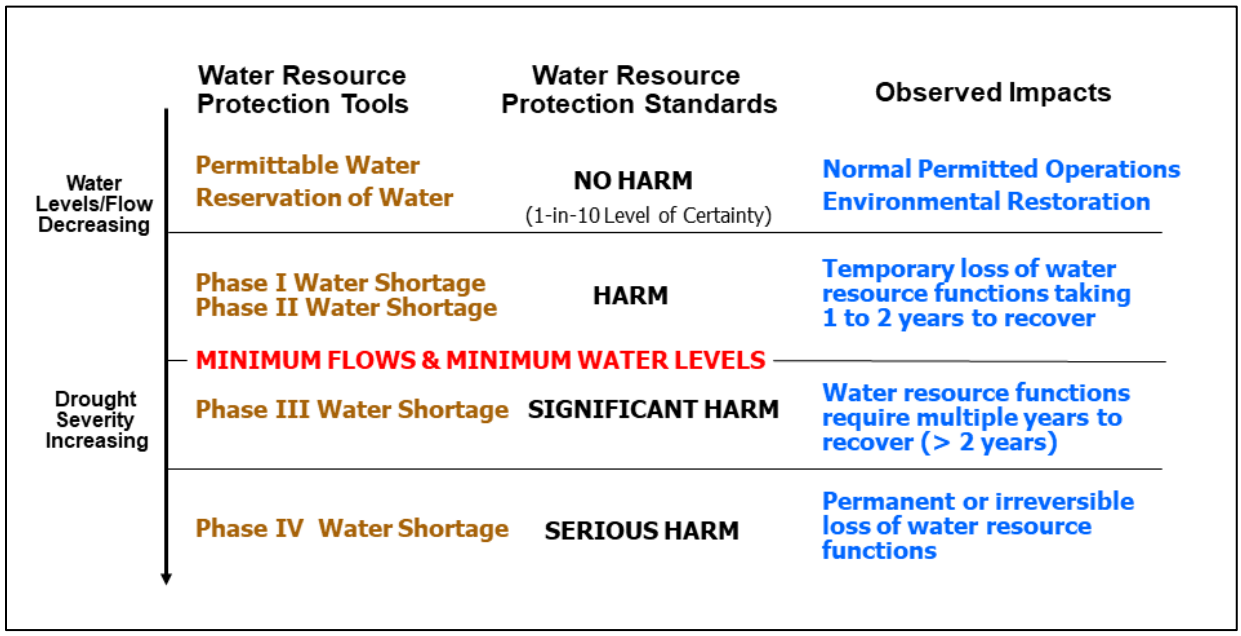


Figure 4-1. Conceptual relationship among water resource protection standards at various levels of water resource harm (Modified from: Rule 40E-8.421, Florida Administrative Code).

Resource Protection Tools	
Water Use Permitting	Unless exempt by statute or identified in the Water Rights Compact of 1987, the right to use water is authorized by permit, which allows for the use of water for reasonable-beneficial uses while protecting natural systems from harm. The conditions of permit issuance are more specifically enumerated in Chapter 40E-2, Florida Administrative Code (F.A.C.). To provide reasonable assurances that the conditions of permit issuance are met, applicants must meet the technical criteria in the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (Applicant's Handbook; SFWMD 2015a). The following technical criteria are used to evaluate potential impacts from the use and quantity of water proposed in a water use permit application: • Potential for saltwater intrusion • Wetland and other surface water body impacts • Pollution • Impacts to off-site land uses • Interference with existing legal users • Regulatory components of MFLs • Water resource availability
Minimum Flows and Minimum Water Levels (MFLs)	MFL criteria are flows or water levels at which the water resources or the ecology of the area would experience significant harm from further withdrawals. If the existing flow or level in a water body is below, or is projected within 20 years to fall below, the applicable MFL established pursuant to Section 373.042, F.S., the SFWMD must simultaneously implement a recovery or prevention strategy [Section 373.0421, F.S.; Subsection 62-640.473(5), F.A.C.].
Water Reservations	A Water Reservation sets aside a volume of water for the protection of fish and wildlife or public health and safety [Section 373.223, F.S.]. Reserved volumes of water are unavailable for allocation to consumptive uses. However, any unreserved volumes of water may be certified as available and allocated to consumptive uses. Water Reservations are developed based on existing water availability or in consideration of future water supplies made available by water resource development projects. The Water Resources Development Act of 2000 and Section 373.470, F.S., require the SFWMD to legally protect Comprehensive Everglades Restoration Plan (CERP) project water before execution of a cost-share agreement between the United States Army Corps of Engineers and SFWMD to construct a CERP project [Section 373.407(3)(c), F.S.].
Water Shortage	Water shortages are declared by the District Governing Board when available groundwater or surface water is insufficient to meet user needs or when conditions require temporary reductions in total use to protect the resource from serious harm. The SFWMD's Water Shortage Plan and regional Water Shortage Plans are contained in Chapters 40E-21 and 40E-22, F.A.C. The regional Water Shortage Plans ensure equitable distribution of available water resources among all water users during times of shortage, consistent with the goals of minimizing adverse economic, social, and health related impacts; provide advance knowledge of the means by which water apportionments and reductions will be made during times of shortage; and promote greater security for water use permittees.
Restricted Allocation Areas (RAAs)	RAA criteria are established by rule for specific sources where there are water resource limitations. RAA criteria established for specific sources or areas of the SFWMD are listed in Section 3.2.1 of the Applicant's Handbook (SFWMD 2015a), which is incorporated by reference in Rule 40E-2.091, F.A.C.

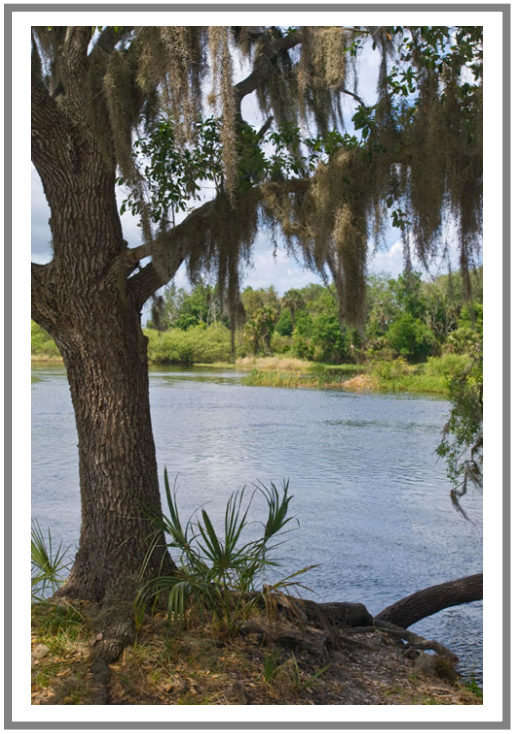
Changes to Water Use Permitting

The *2000 Kissimmee Basin Water Supply Plan* (SFWMD 2000) recommended incorporation of resource protection criteria (e.g., MFLs, Water Reservations, RAAs), level of certainty, special designations, and permit durations into water use permitting criteria. A series of rulemaking efforts was completed in September 2003, resulting in amendments to various rules, including Chapters 40E-1, 40E-2, 40E-5, 40E-8, and 40E-21, Florida Administrative Code (F.A.C.). Among the most notable changes were amendments to permit duration, permit renewal, wetland protection, supplemental irrigation requirements, saltwater intrusion, aquifer storage and recovery, and model evaluation criteria.

In 2011, the Florida Department of Environmental Protection (FDEP) led a statewide initiative to improve consistency in the water use permitting programs implemented by the state's five water management districts. The initiative resulted in changes to SFWMD water use permitting rules and criteria, which became effective in 2014 and are listed in the Applicant's Handbook (SFWMD 2015a).

Additional Protection Afforded Water Resources

The water resource protection criteria contained in the conditions for permit issuance enumerated in Rule 40E-2.301, F.A.C., and the Applicant's Handbook (SFWMD 2015a) include three additional mechanisms to protect water resources: 1) implementation criteria for regulatory components of an adopted MFL prevention or recovery strategy, 2) implementation criteria for Water Reservations, and 3) RAA criteria. Water bodies for which these mechanisms have been adopted in the LKB Planning Area are shown in **Figure 4-2**.



The SFWMD has adopted Water Reservation and RAA rules to facilitate construction of Comprehensive Everglades Restoration Plan (CERP) project components. Federal and state law requires natural system water provided by CERP projects be reserved or allocated before executing cost-share agreements for project construction. The United States Army Corps of Engineers (USACE) has verified that federal requirements have been met for several CERP projects through SFWMD adoption of Water Reservations and establishment of RAAs. Together, these rules protect water resources across substantial portions of the District. **Figure 4-3** presents a map of CERP and other restoration projects planned for construction over the next 20 years that provide water supplies supporting MFL, RAA, and Water Reservation water bodies.

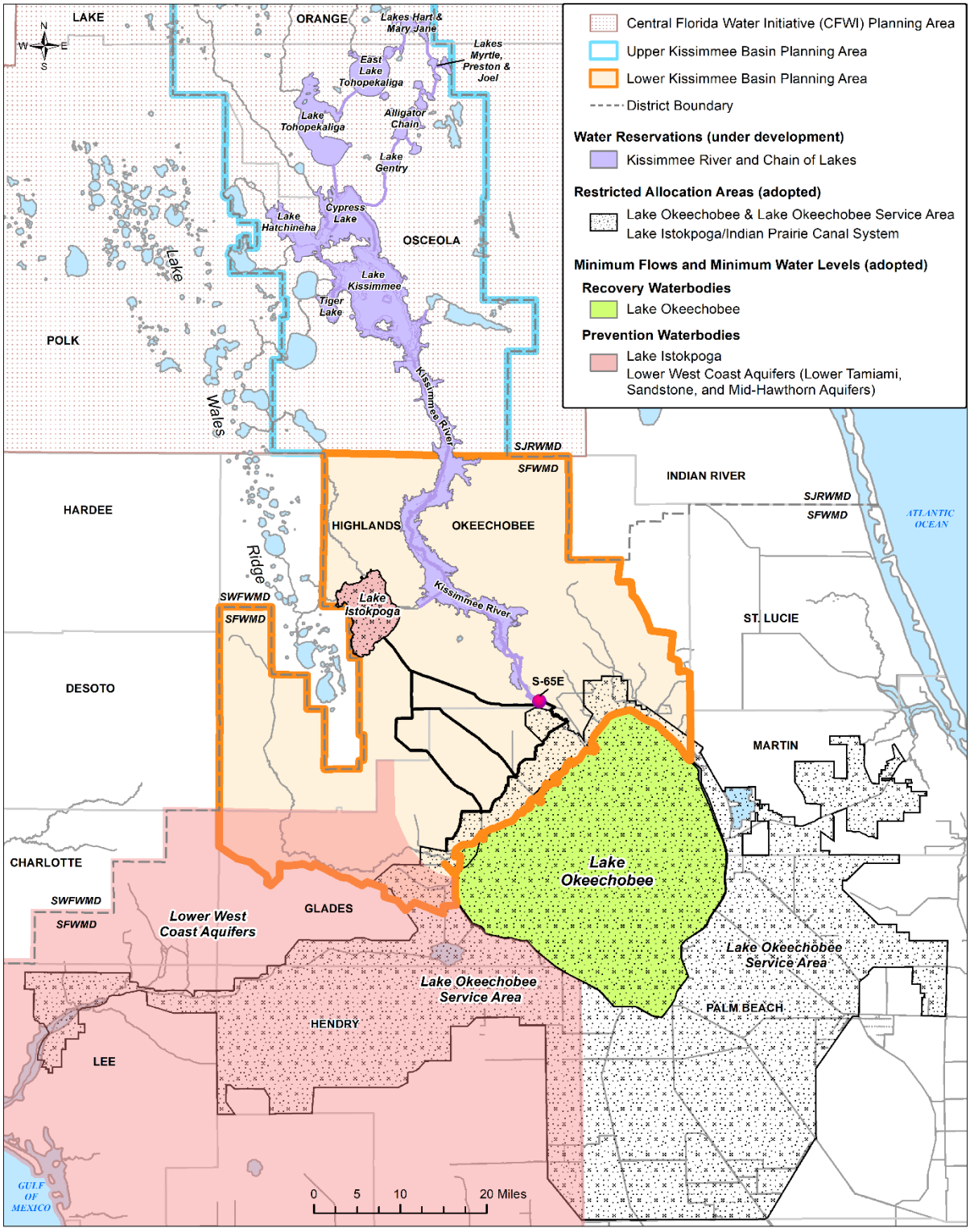


Figure 4-2. Adopted Minimum Flows and Minimum Water Levels, Restricted Allocation Areas, and proposed Water Reservations in the LKB Planning Area.

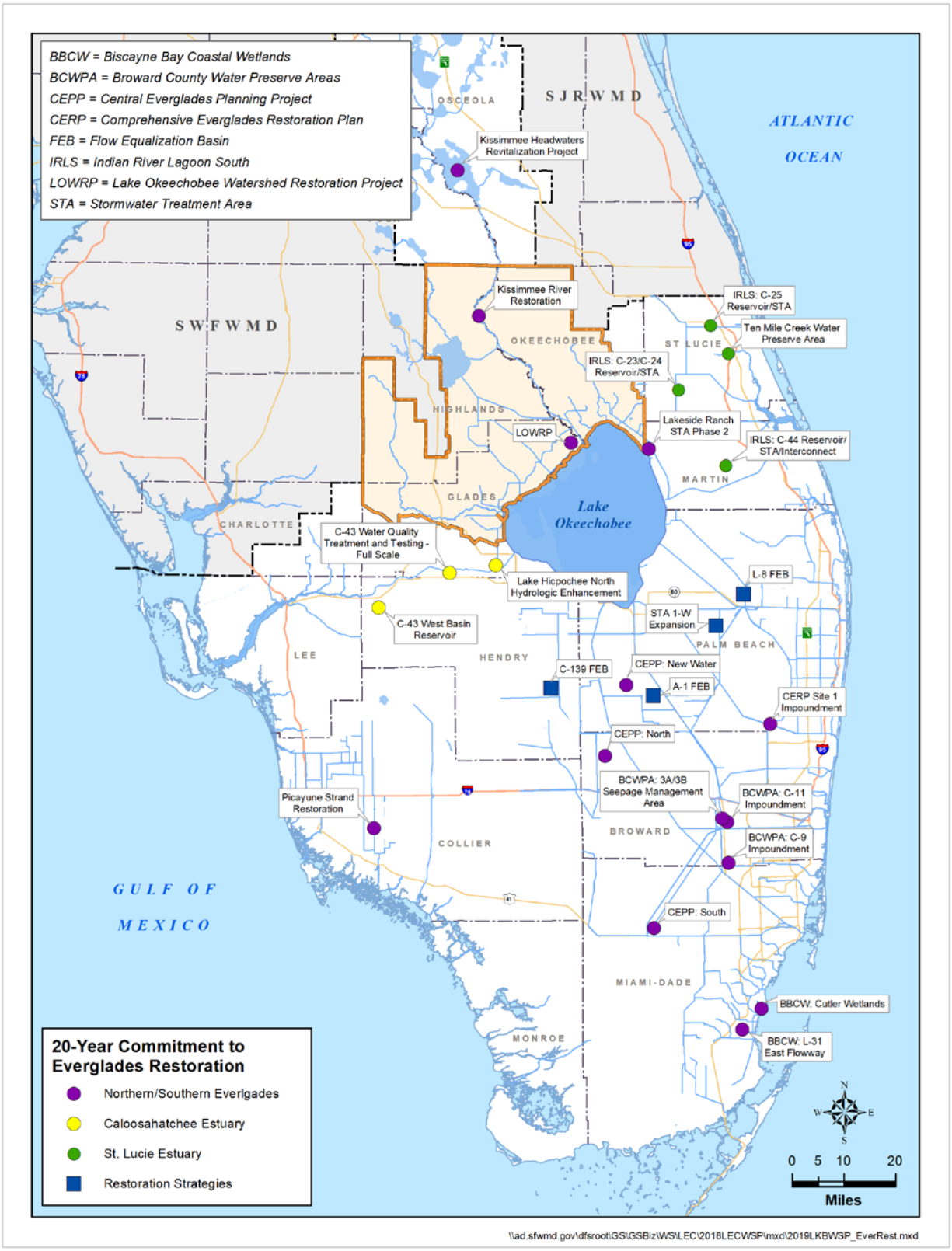


Figure 4-3. Comprehensive Everglades Restoration Plan (CERP) and other restoration projects that support protected water bodies.

Minimum Flows and Minimum Water Levels

MFL criteria are flows or levels at which water resources, or the ecology of the area, would experience significant harm from further withdrawals. Adopted MFLs in the SFWMD are contained in Chapter 40E-8, F.A.C. Significant harm is defined in Subsection 40E-8.021(31), F.A.C., as the temporary loss of water resource functions, which results from a change in surface water or groundwater hydrology that takes more than 2 years to recover but is considered less severe than serious harm. An MFL exceedance occurs when an MFL water body falls below the minimum flow or level for longer than specified in the rule [Subsection 40E-8.021(17), F.A.C.].

MFL criteria are applied individually to affected water bodies and define the minimum flow or minimum water level for surface water bodies, or minimum water level for groundwater in aquifers. When establishing MFLs, the District Governing Board considers changes and structural alterations to watersheds, surface water bodies, and aquifers as well as the effects such changes or alterations have had and the constraints such changes or alterations have placed on the hydrology of an affected watershed, surface water body, or aquifer [Section 373.0421, F.S.].

The SFWMD continues to fulfill its statutory obligation to identify key water bodies for which MFLs should be developed or re-evaluated. Each water management district must provide an annual priority list and schedule for development of MFLs and Water Reservations to the FDEP [Section 373.042, F.S.]. The SFWMD's current priority list and schedule are available in Volume II – Chapter 3 (Edwards 2019) of the *2019 South Florida Environmental Report*. The priority list is based on the importance of the water bodies to the state or region and the existence of, or potential for, significant harm to the water resources or ecology of the state or region and includes water bodies that are experiencing or may reasonably be expected to experience adverse impacts.

Recovery strategies must be adopted and implemented for water bodies where MFLs currently are violated [Section 373.0421, F.S.]. The goal of a recovery strategy is to achieve the established MFL as soon as practicable. Prevention strategies are required for water bodies where MFLs currently are not violated but are projected to be violated within 20 years of the establishment of the MFL. The goal of a prevention strategy is to continue to meet the established MFL criteria over the next 20-year planning horizon. The SFWMD adopts prevention and recovery strategies when the MFL is initially adopted [Rule 40E-8.421, F.A.C.].

Recovery and prevention strategies must include phasing or a timetable that will allow for the provision of sufficient water supplies for all existing and projected reasonable-beneficial uses, including development of additional water supplies and implementation of conservation and other efficiency measures consistent with the provisions of Sections 373.0421 and 373.709, F.S. MFL recovery and prevention strategies are implemented in phases with consideration of the SFWMD's missions in managing water resources, including water supply, flood protection, environmental enhancement, and water quality protection, as required by Section 373.016, F.S.

MFLs and associated recovery or prevention strategies have been adopted for three water bodies in the LKB Planning Area: Lake Istokpoga, Lake Okeechobee, and the Lower West Coast aquifers. The adopted MFL and prevention strategy for Lake Istokpoga is discussed in this plan update. MFLs and recovery and prevention strategies for Lake Okeechobee and the Lower West Coast aquifers affect portions of the LKB Planning Area but are included in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018) and *2017 Lower West Coast Water Supply Plan Update* (SFWMD 2017), respectively.

Lake Istokpoga MFL

Lake Istokpoga covers 44 square miles, making it the fifth largest lake in Florida (**Figure 4-2**). The lake is shallow, averaging 4 to 6 feet in depth. It is fed by two creeks, Arbuckle Creek and Josephine Creek, and it is connected to Lake Okeechobee through the Indian Prairie Canal System (**Figure 4-4**).

An MFL of 36.5 feet National Geodetic Vertical Datum of 1929 (NGVD29) was adopted for the lake in 2006 [Subsection 40E-8.351, F.A.C.]. At the time of MFL adoption, Lake Istokpoga was meeting the MFL and no violations were anticipated to occur in the next 20 years. Therefore, a prevention strategy was adopted for it simultaneously with MFL adoption [Subsection 40E-8.421(7), F.A.C.].

More information on the Lake Istokpoga MFL and prevention strategy is provided in **Appendix C**. Information on all MFLs and recovery and prevention strategies that have been adopted in the LKB Planning Area and throughout the District can be found in Chapter 40E-8, F.A.C., and on the SFWMD website (www.sfwmd.gov; Search: MFLs).

Lake Istokpoga

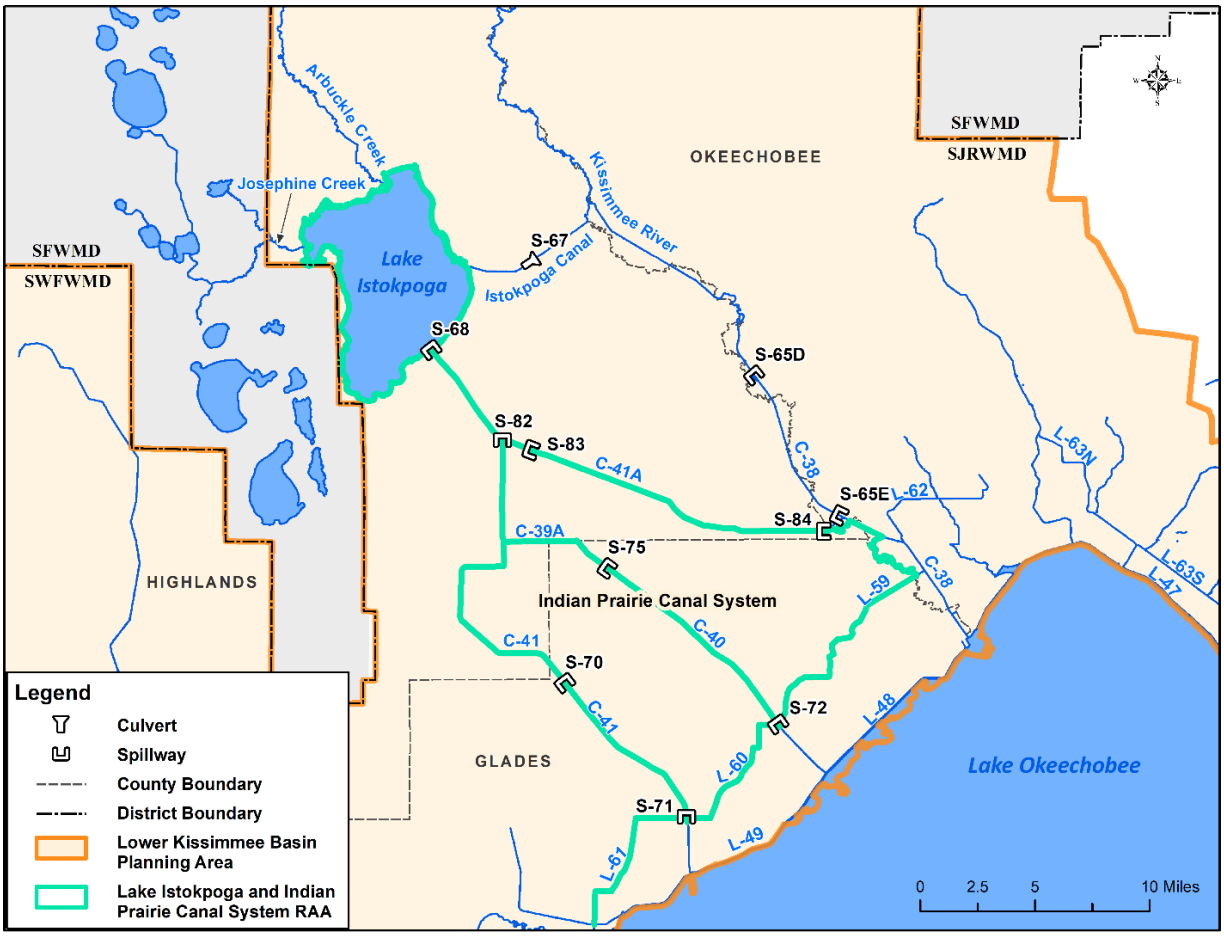


Figure 4-4. Location of Lake Istokpoga relative to the Indian Prairie Canal System and Lake Okeechobee, and the Lake Istokpoga/Indian Prairie Canal System Restricted Allocation Area.

Water Reservations

Regional water supply plans must include reservations of water for the planning area, which are defined and adopted by rule [Section 373.709, F.S.]. A Water Reservation sets aside a volume of water for the protection of fish and wildlife or public health and safety. Water Reservations are developed based on existing water availability or in consideration of future water supplies made available by water resource development projects. Reserved volumes of water are unavailable for allocation to consumptive uses [Section 373.223, F.S.]. Water Reservations do not 1) establish operating regimes, 2) drought-proof natural systems, or 3) ensure wildlife proliferation. Additionally, Water Reservations may be a component of an MFL recovery or prevention strategy.

The Water Resources Development Act of 2000 and Section 373.470, F.S., require the SFWMD to protect CERP project water before executing a cost-share agreement with the USACE to construct such projects [Section 373.407(3)(c), F.S.]. A Water Reservation is one tool that can be used for this protection. Any water made available by a CERP project in excess of that needed for natural system restoration may be certified as available and allocated to consumptive uses to meet the CERP goal of water made available for other water-related uses.

Adopted Water Reservations in the SFWMD are contained in Chapter 40E-10, F.A.C. This F.A.C. chapter defines the quantity, location, and timing of waters reserved from allocation for the protection of fish and wildlife or public health and safety for all reservation water bodies in the SFWMD, pursuant to Section 373.223(4), F.S. To date, no Water Reservations have been adopted in the LKB Planning Area. However, pursuant to the 2018 Priority List and Schedule (Edwards 2019), the SFWMD is in the process of developing Water Reservations for the Kissimmee River and Chain of Lakes for the protection of fish and wildlife (**Figure 4-2**).

Kissimmee River and Chain of Lakes Water Reservations Development

Snail Kite (*Rostrhamus sociabilis*) with snail

Maintaining the availability of water is a key component of environmental restoration and management of the Kissimmee River and Chain of Lakes as well as Lake Okeechobee and the Everglades, for which the Kissimmee River and Chain of Lakes provide headwaters. The Kissimmee River and Chain of Lakes provide approximately 50 percent of the surface water flow into Lake Okeechobee (SFWMD et al. 2011). Together, these remarkable Central Florida water resources shelter 178 species of fish, wetland-dependent wading birds, amphibians, reptiles, and mammals. The LKB Planning Area contains a nationally recognized largemouth bass (*Micropterus salmoides*) fishery, nesting colonies of endangered Wood Storks (*Mycteria americana*) and Snail Kites (*Rostrhamus sociabilis*), and one of the largest concentrations of nesting Bald Eagles (*Haliaeetus leucocephalus*) in the United States (SFWMD 2015b).

NOTE

The Kissimmee River and Chain of Lakes Water Reservations will support the ongoing Kissimmee River Restoration Project being constructed through a 50-50 cost-share agreement between the SFWMD and USACE. The Kissimmee River Restoration Project will return a portion of the historical channels and flows of the Kissimmee River and floodplain to those existing prior to river channelization in the 1960s (USACE 2019).

The Kissimmee River and Chain of Lakes Water Reservations area is 172,500 acres and spans portions of the LKB Planning Area as well as the Upper Kissimmee Basin Planning Area (part of the Central Florida Water Initiative [CFWI]) (**Figure 4-2**). The Kissimmee Chain of Lakes (Upper Chain of Lakes and the Headwaters Revitalization Lakes) (**Figure 4-5**) is the primary source of water for the Kissimmee River. The Kissimmee River downstream of the S-65A structure is within the LKB Planning Area.

As shown in **Figure 4-5**, there are three main groupings of water bodies proposed for inclusion in the Kissimmee River and Chain of Lakes Water Reservations: Upper Chain of Lakes, Headwaters Revitalization Lakes, and the Kissimmee River. Within these three groupings are many lakes, canals, floodplains, and remnant channels. The

proposed Water Reservations include 1) all surface water in the Kissimmee River and floodplain and in the Headwaters Revitalization Lakes; 2) quantities of surface water up to specified stages in the Upper Chain of Lakes; and 3) groundwater in the surficial aquifer system contributing to the Water Reservation water bodies. The proposed reservations protect the volume of water needed by fish and wildlife under restored conditions.

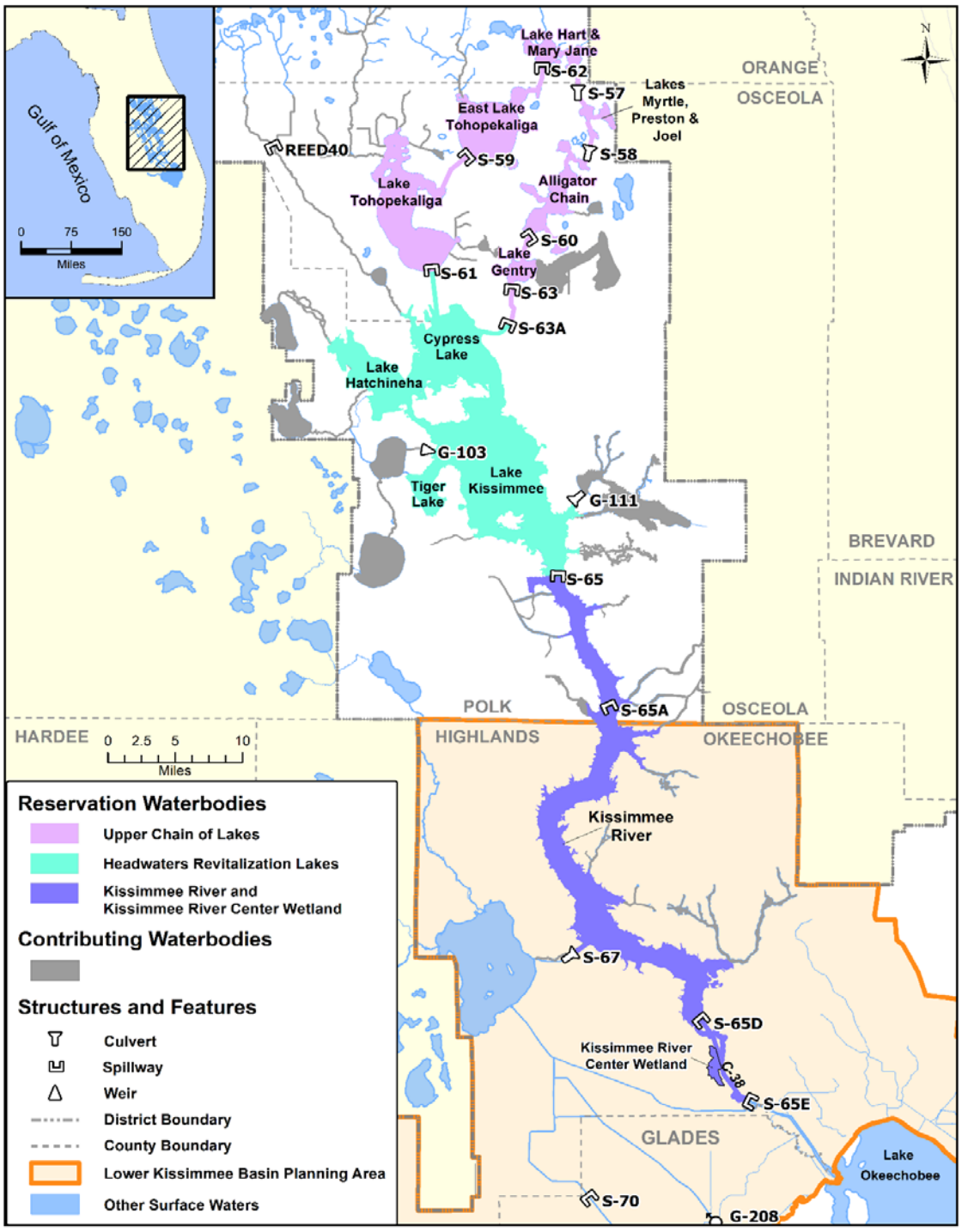


Figure 4-5. Proposed Kissimmee River and Chain of Lakes Water Reservations and contributing water bodies.

Technical Approach and Rule Development

The process of developing Water Reservation rules includes scientific research and technical evaluations to characterize the water resources involved, link their functions to water needs, and establish scientifically based criteria for meeting those needs. Development of the Kissimmee River and Chain of Lakes Water Reservations has been an ongoing process for several years, predating the current 2018 Priority List and Schedule. The District Governing Board first authorized development of the Kissimmee River and Chain of Lakes Water Reservations in June 2008. The project was postponed in 2009 and reauthorized in 2014.

The SFWMD's technical approach to quantify water needed for the protection of fish and wildlife in the Kissimmee River and Chain of Lakes includes the following steps:

- Identifying and delineating the reservation water bodies;
- Identifying the fish and wildlife species and plant community habitats to be protected;
- Linking the responses of fish and wildlife in the water bodies to stage and/or flow;
- Identifying water available over a representative range of hydrologic conditions (i.e., base condition); and
- Determining the timing and amount of water needed for the protection of fish and wildlife across a representative range of hydrologic conditions.

The SFWMD identified and delineated the reservation water bodies and the species and habitats to be protected, established linkages between species and their hydrologic requirements, and conducted model development. Rule language was developed, and two public workshops were held in 2014. A draft technical document outlining the SFWMD's technical approach for developing the Water Reservations was developed in 2015 (SFWMD 2015c). Multiple public comments were received in response to the proposed rule language and technical document. SFWMD staff initiated additional modeling and analyses to address concerns about impacts to endangered species and existing legal users within LOSA.

Addressing the public comments received in 2015 and 2016 is ongoing. Additional public workshops will be held in 2019 and 2020 for the Kissimmee River and Chain of Lakes Water Reservations rulemaking effort. The SFWMD anticipates rule adoption in 2020. Once the Water Reservation and implementing rules are effective, the SFWMD's water use permitting staff will use the additional water resource protection criteria in the rules to ensure future consumptive uses will not withdraw or impact reserved water supplies in the Kissimmee River and Chain of Lakes.

More information on the draft Kissimmee River and Chain of Lakes Water Reservations is provided on the SFWMD website (www.sfwmd.gov; Search: Water Reservations). Information on all adopted Water Reservations in the District can be found on the SFWMD website and in Chapter 40E-10, F.A.C.

Restricted Allocation Areas

RAAs are defined geographic areas where water allocations from specific water resources (e.g., lakes, rivers, wetlands, canals, aquifers) are limited. Allocations beyond the established limitation are restricted or prohibited. RAAs are established for a variety of reasons, including 1) where there is insufficient water to meet the projected needs of a region, 2) to protect

water for natural systems and future restoration projects (e.g., CERP), or 3) as part of MFL recovery or prevention strategies. RAA criteria are listed in Section 3.2.1 of the Applicant's Handbook (SFWMD 2015a), which is incorporated by reference in Rule 40E-2.091, F.A.C. **Figure 4-2** shows the locations of established RAAs wholly or partially in the LKB Planning Area.

Lake Istokpoga/Indian Prairie Canal System RAA

The water level in Lake Istokpoga is controlled by operation of water control structures S-67 and S-68 (**Figure 4-4**) in accordance with the Lake Istokpoga Regulation Schedule adopted by the USACE and implemented by the SFWMD (**Figure 4-6**). Lake Istokpoga and the Indian Prairie Canal System are primary water sources for meeting agricultural irrigation demand in the Indian Prairie Basin and the water entitlement for the Seminole Tribe of Florida's Brighton Reservation. During normal rainfall years, releases from the lake can be made for flood control and sufficient water is available to meet water demand. However, during drought years, releases from the lake become infrequent and efforts are made to maintain the lake's minimum operating schedule through declared water shortages. Issues of water availability generally have occurred when a late summer drought has caused rainfall to be insufficient to maintain the lake above Zone C of the regulation schedule (**Figure 4-6**).

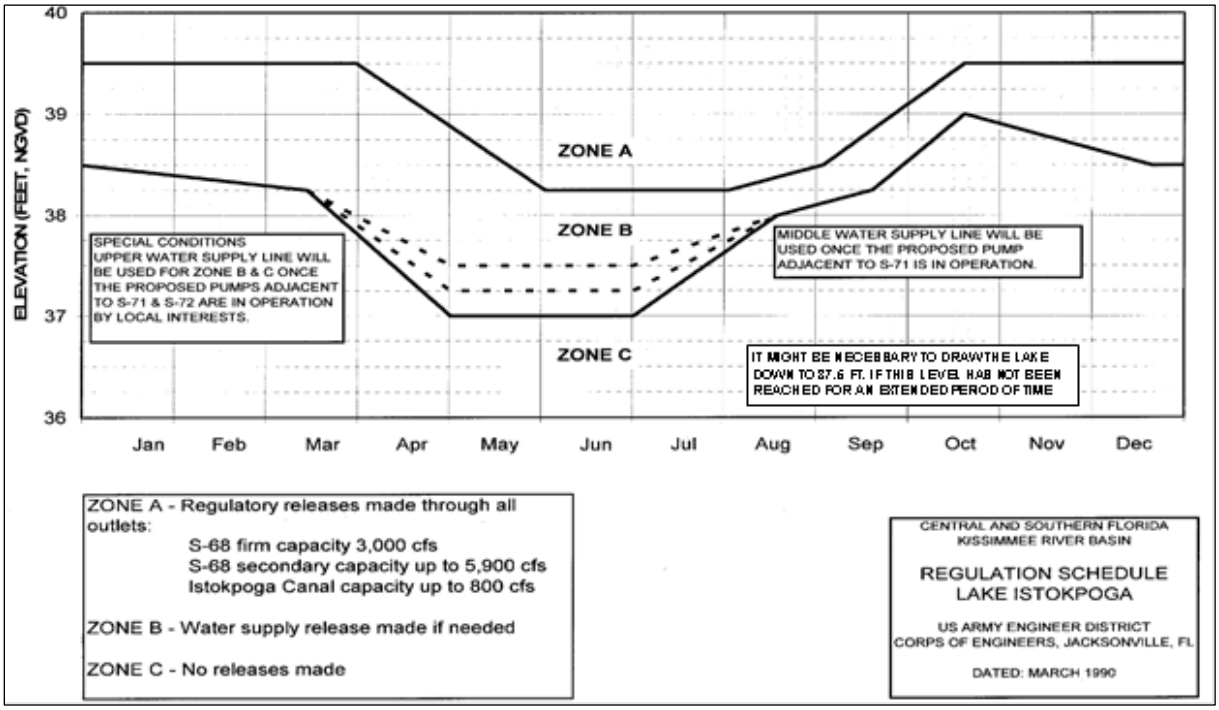


Figure 4-6. Lake Istokpoga Regulation Schedule.

The District Governing Board adopted RAA criteria in 1981 for the Lake Istokpoga/Indian Prairie Canal System (Subsection 3.2.1.A of the Applicant's Handbook [SFWMD 2015a]). Additional surface water allocations from Lake Istokpoga and the Indian Prairie Canal System above existing allocations are prohibited. The RAA and District operations minimize the potential for District-declared water shortages in the Indian Prairie Basin during periods of drought and ensures sufficient water for existing allocations and delivery to the Brighton Reservation pursuant to the 1987 Water Rights Compact among the Seminole Tribe of

Florida, the State of Florida, and the SFWMD [Public Law 100-228, 101 Statute 1566, and Chapter 87-292, Laws of Florida, as codified in Section 285.165, F.S.] and implementing agreements, as discussed below. Further information about the RAAs established in the LKB Planning Area can be found in the Applicant's Handbook (SFWMD 2015a).

Lake Okeechobee Service Area RAA

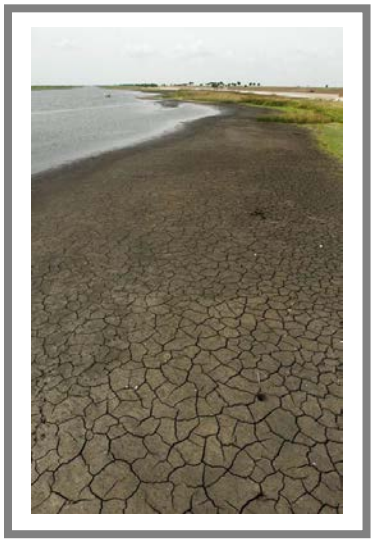
In October 2008, the District Governing Board adopted RAA criteria for LOSA (Subsection 3.2.1.F of the Applicant's Handbook [SFWMD 2015a]; **Figure 4-2**). The RAA covers more than 1.8 million acres, including Lake Okeechobee and the integrated conveyance systems that are hydraulically connected to and receive water from Lake Okeechobee such as the C-43 Canal, the C-44 Canal, and secondary canal systems that receive Lake Okeechobee water for water supply purposes via gravity flow or pump. Net increases in the volume of surface water withdrawn from the RAA are prohibited over that resulting from base condition water uses occurring from April 1, 2001 to January 1, 2008. Allocations over the base condition water use are only allowed through sources detailed in Subsection 3.2.1.F.3.c of the Applicant's Handbook (SFWMD 2015a), such as certified project water, implementation of offsets, alternative water supply, available and unassigned base condition water use, or base condition water use that was terminated or reduced after January 1, 2008.

The RAA criteria were necessitated by the impacts to water supply and predicted exceedances of the MFL criteria from implementation of the 2008 Lake Okeechobee Regulation Schedule, which reduced stages in Lake Okeechobee by approximately 1 foot due to concerns with Herbert Hoover Dike integrity. The RAA is part of the MFL recovery strategy for Lake Okeechobee described in the 2008 Amendment to Appendix H of the *2005-2006 Lower East Coast Water Supply Plan Update* (SFWMD 2008). The Lake Okeechobee RAA is further discussed in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018).

Herbert Hoover Dike

The State provided funding to assist the USACE in expediting the Herbert Hoover Dike rehabilitation. The current Integrated Delivery Schedule (USACE 2018) indicates completion of the Herbert Hoover Dike rehabilitation by 2022. An evaluation of a revision of the 2008 Lake Okeechobee Regulation Schedule, the Lake Okeechobee System Operating Manual (LOSOM), a component of the C&SF Project System Operating Plan, was initiated by the USACE in 2019. One purpose of the LOSOM effort is to re-evaluate and define operations for the Lake Okeechobee regulation schedule that account for additional infrastructure that will be operational in the near future. More information on the LOSOM effort can be found at www.saj.usace.army.mil/LOSOM.

Water Shortage Rules



Water shortages are declared to prevent serious harm from occurring to water resources, including related natural systems [Sections 373.175 and 373.246, F.S.]. Serious harm is defined as the long-term loss of water resource functions resulting from a change in surface water or groundwater hydrology [Subsection 40E-8.021(30), F.A.C.] (**Figure 4-1**).

The water shortage plans described in Chapters 40E-21 and 40E-22, F.A.C., are applied to manage water use when insufficient groundwater or surface water is available to meet user needs or when conditions require temporary water use reduction. Chapter 40E-22, F.A.C., contains regional water shortage plans and restrictions related to specific water bodies, including Lake Istokpoga and Lake Okeechobee. Further information on water shortage management is available in the *2016 Water Supply Plan Update Support Document* (SFWMD 2016).

Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the South Florida Water Management District

The Seminole Tribe of Florida has surface water entitlement pursuant to the 1987 Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the SFWMD [Public Law 100-228, 101 Statute 1566, and Chapter 87-292, Laws of Florida, as codified in Section 285.165, F.S.]. Documents executed among the parties subsequent to the Compact address Compact entitlement provisions. One such document is the *Agreement Between SFWMD and the Seminole Tribe of Florida and Water Supply Plan for the Brighton Reservation Implementing Section VI.B of the Compact and Subparagraph 3.3.32.A.3 of the Criteria Manual* (Agreement No. C-4121). Agreement No. C-4121 attempts to ensure dependable water deliveries to the Brighton Reservation in the Indian Prairie Basin by outlining the delivery of water from Lake Istokpoga and Lake Okeechobee under normal and water shortage conditions and defining optimum water levels in certain canal segments.

Other Water Resource Protection Constraints

As part of this 2019 LKB Water Supply Plan Update, other constraints and potential constraints in areas outside but adjacent to the LKB Planning Area were considered by the SFWMD in its long-term water supply planning effort. These areas are hydrologically and/or geologically connected to the LKB Planning Area through surface waters or underlying aquifers. Adverse impacts could include lowering water levels in connected surface water bodies through direct surface water withdrawals or lowering water levels in aquifers through groundwater withdrawals, thereby affecting water levels in surface water bodies connected to the aquifers. Of particular interest are water resources in adjacent areas for which constraints have been established or proposed, such as MFL water bodies with recovery or prevention strategies, Water Reservation water bodies, and water use caution areas. Areas

adjacent to the LKB Planning Area with perhaps the greatest potential for water resource impacts from LKB water demand include:

- The CFWI Planning Area, north of the LKB Planning Area;
- The southern portion of the St. Johns River Water Management District (SJRWMD), northeast of the LKB Planning Area; and
- The Southern Water Use Caution Area (SWUCA) within the Southwest Florida Water Management District (SWFWMD), west of the LKB Planning Area and containing Lake Wales Ridge.

The following provides an overview of the constraints and potential constraints in these three areas, which were identified with the assistance and coordination with the SJRWMD and SWFWMD.

CFWI Planning Area Constraints

The CFWI Planning Area encompasses parts of the SFWMD, SWFWMD, and SJRWMD. The SFWMD's Upper Kissimmee Basin Planning Area composes the central portion of the CFWI Planning Area. It adjoins the northern border of the LKB Planning Area (**Figure 4-2**) and is connected hydrologically to the LKB Planning Area through surface waters and underlying aquifers. The northern portion of the proposed Kissimmee River and Chain of Lakes Water Reservations is located in the Upper Kissimmee Basin Planning Area (**Figures 4-2** and **4-5**). The draft Water Reservations propose prohibiting and/or establishing limits on water allocations from the reservation water bodies, thereby protecting water levels in the Kissimmee River and Chain of Lakes and adjacent areas.

Southern SJRWMD Constraints

The southern part of the SJRWMD adjoins the northern and eastern borders of the LKB Planning Area in Okeechobee County (**Figure 4-7**). The SJRWMD identified three water resources in this area with the potential for impacts from LKB water demand over the 2040 planning horizon: Blue Cypress Conservation Area, Blue Cypress Water Management Area within the Blue Cypress Conservation Area, and Fort Drum Marsh Conservation Area. The SJRWMD has adopted an MFL for the Blue Cypress Water Management Area. According to the SJRWMD, determining the sensitivity of these three areas to LKB groundwater withdrawals from the Upper Floridan aquifer requires further study that is not currently planned by the SJRWMD. However, the Upper Floridan aquifer is a confined aquifer with approximately 250 feet of hydraulic separation from the surficial aquifer system. Because these three areas are surface water and wetland features, groundwater withdrawals from the Upper Floridan aquifer are unlikely to affect them due to the geologic confinement.

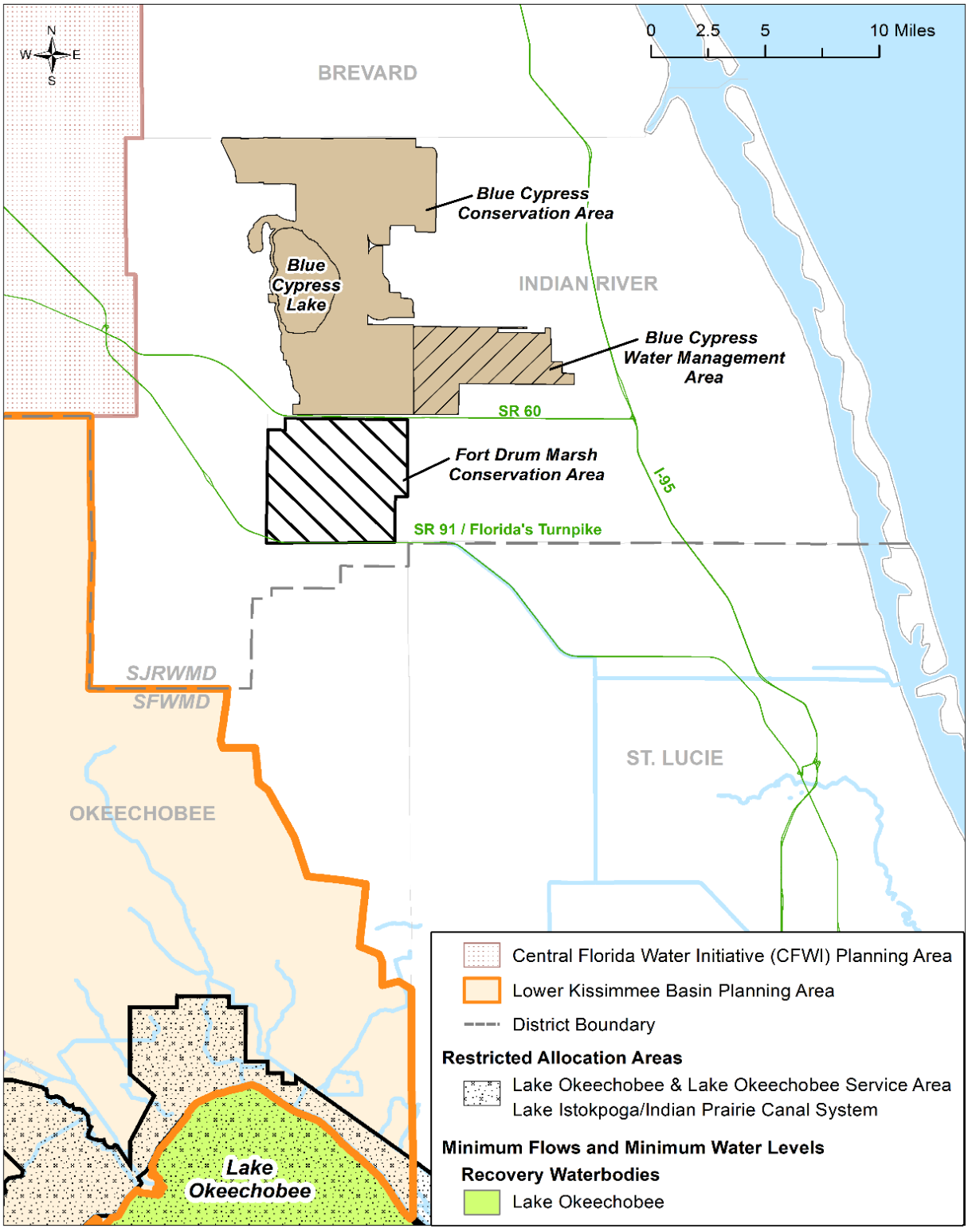


Figure 4-7. St. Johns River Water Management District water resources with constraints northeast of the LKB Planning Area.

SWFWMD Constraints (SWUCA and Lake Wales Ridge)

SWUCA adjoins the western border of the LKB Planning Area in Highlands, Hardee, and DeSoto counties (**Figure 4-8**). A prominent topographic feature in SWUCA is Lake Wales Ridge (**Figure 4-8**). Per Yobbi (1996), the western part of the ridge is drained by the Peace River and its major tributaries, Payne, Charlie, Joshua, and Prairie creeks. The eastern part of the ridge is drained by the Kissimmee River and its major tributaries, Arbuckle Creek and Josephine Creek. Previous studies by the SWFWMD concluded that the groundwater levels in the Floridan aquifer system have a close relationship with the water levels observed in lakes along Lake Wales Ridge due to its underlying karst geology and associated connectivity. Since the early 1960s, declines in water levels in many of the lakes on Lake Wales Ridge have occurred due to below-normal rainfall, increased groundwater pumpage for agricultural and industrial use, reduced recharge, and alterations to the surface drainage systems (Barcelo et al. 1990). The following constraints were considered by the SFWMD.

Lake Constraints

The SWFWMD determined several lakes along the Lake Wales Ridge are stressed and established MFLs for 32 of them (FDEP 2018, SWFWMD 2018) (**Table 4-1**, **Figure 4-8**). Twelve of the 32 lakes are meeting their MFLs, two of which have prevention strategies (Lake June-in-Winter and Lake Placid). Twenty of the 32 lakes are not meeting their MFLs (FDEP 2018; D. Leeper, SWFWMD, pers. comm., February 22, 2019) and are covered by the SWUCA recovery strategy (SWFWMD 2006). All 32 lakes with MFLs are in SWUCA except Lake Lowery; 20 are in the CFWI Planning Area, which overlaps SWUCA; and 12 border the LKB Planning Area. In its 2018 Priority List and Schedule, the SWFWMD identified all 32 lakes, except Lake Hancock and Lake Parker, as potentially affected by groundwater withdrawals in the SFWMD (SWFWMD 2018).

Well Constraints

The SWFWMD adopted an MFL for the SWUCA-Upper Floridan aquifer, which is covered by the SWUCA recovery strategy (SWFWMD 2006). The regulatory component of the SWUCA recovery strategy requires applicants seeking an allocation from groundwater to provide reasonable assurance the proposed withdrawals will not impact groundwater levels beneath the Upper Peace River where the river's MFL is not being met (CFWI 2015; D. Leeper, SWFWMD, pers. comm., February 22, 2019) and Lake Wales Ridge where several lake MFLs also are not being met (CFWI 2019). Impacts to groundwater levels are assessed by monitoring water levels in five Upper Peace River regulatory wells and five Ridge Lakes regulatory wells (**Table 4-1**, **Figure 4-8**). Moving averages of well water levels are calculated and compared to target regulatory levels to determine groundwater level and to inform water use permitting decisions. Water levels in the Upper Peace River and Ridge Lakes regulatory wells currently are meeting target levels (CFWI 2019). In their 2018 Priority List and Schedule, the SWFWMD identified the SWUCA-Upper Floridan aquifer, where the Upper Peace River and Ridge Lakes regulatory wells are located, as potentially affected by groundwater withdrawals in the SFWMD (SWFWMD 2018). Two of the Ridge Lakes regulatory wells are near the LKB Planning Area.

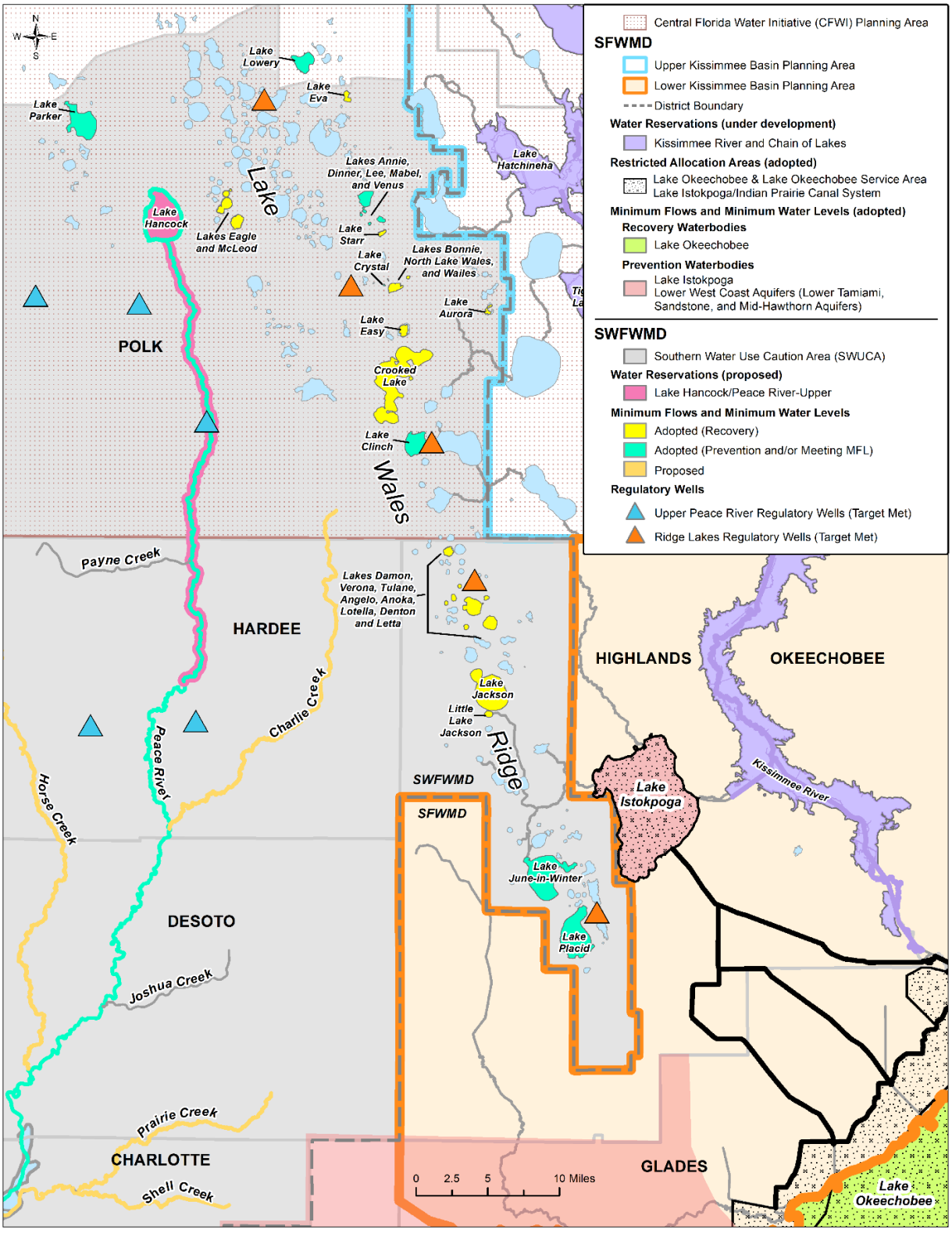


Figure 4-8. Southwest Florida Water Management District water resources with constraints north and west of the LKB Planning Area.

Table 4-1. Southwest Florida Water Management District (SWFWMD) water bodies with constraints along Lake Wales Ridge and/or in the Southern Water Use Caution Area (SWUCA).

Water Body	2018/2019 MFL or Target Status[1]	SWUCA Recovery Strategy	Prevention Strategy	Near LKB Planning Area	In CFWI Planning Area	Potentially Affected by SFWMD Water Withdrawals[2]
Adopted MFLs – Lakes						
Annie	Meeting				*	*
Clinch	Meeting				*	*
Crystal	Meeting				*	*
Dinner	Meeting				*	*
Hancock	Meeting				*	
June-in-Winter	Meeting		*	*		*
Lee	Meeting				*	*
Lowery	Meeting				*	*
Mabel	Meeting				*	*
Parker	Meeting				*	
Placid	Meeting		*	*		*
Venus	Meeting				*	*
Angelo	Not Meeting	*		*		*
Anoka	Not Meeting	*		*		*
Aurora	Not Meeting	*			*	*
Bonnie	Not Meeting	*			*	*
Crooked	Not Meeting	*			*	*
Damon	Not Meeting	*		*		*
Denton	Not Meeting	*		*		*
Eagle	Not Meeting	*			*	*
Easy	Not Meeting	*			*	*
Eva	Not Meeting	*			*	*
Jackson	Not Meeting	*		*		*
Letta	Not Meeting	*		*		*
Little Lake Jackson	Not Meeting	*		*		*
Lotela	Not Meeting	*		*		*
McLeod	Not Meeting	*			*	*
North Lake Wales	Not Meeting	*			*	*
Starr	Not Meeting	*			*	*
Tulane	Not Meeting	*		*		*
Verona	Not Meeting	*		*		*
Wailes	Not Meeting	*			*	*
Adopted MFLs – Rivers						
Peace River – Upper[3]	Not Meeting	*			*	
Peace River – Middle	Meeting					
Peace River – Lower	Meeting					
Proposed MFLs						
Shell Creek - Upper and Lower	N/A	N/A	N/A	*		
Charlie Creek	N/A	N/A	N/A	*	*	
Horse Creek	N/A	N/A	N/A			
Prairie Creek	N/A	N/A	N/A	*		

Water Body	2018/2019 MFL or Target Status[1]	SWUCA Recovery Strategy	Prevention Strategy	Near LKB Planning Area	In CFWI Planning Area	Potentially Affected by SFWMD Water Withdrawals[2]
Proposed Water Reservations						
Lake Hancock/Peace River-Upper	N/A	N/A	N/A		*	
Regulatory Wells						
Ridge Lakes Regulatory Wells	Meeting			*	*	SWUCA-Upper Floridan aquifer
Upper Peace River Regulatory Wells	Meeting				*	SWUCA-Upper Floridan aquifer

CFWI = Central Florida Water Initiative; LKB = Lower Kissimmee Basin; MFL = Minimum Flow and Minimum Water Level; N/A = not applicable or available; SFWMD = South Florida Water Management District.

1 From FDEP (2018), except Lakes Aurora, Damon, and Easy (MFL status obtained from D. Leeper, SWFWMD, pers. comm., February 22 and June 25, 2019).

2 From SWFWMD (2018).

3 The Upper Peace River is divided into three segments. Two of the three segments currently are not meeting the MFL (CFWI 2015; D. Leeper, SWFWMD, pers. comm., February 22, 2019).

Other Considerations

The SWFWMD adopted MFLs for the Upper, Middle, and Lower segments of the Peace River; proposed MFLs for Shell Creek (Upper and Lower segments), Charlie Creek, Horse Creek, and Prairie Creek; and are proposing a Water Reservation for the Lake Hancock/Peace River-Upper complex (**Table 4-1**, **Figure 4-8**). While these water bodies are in SWUCA just west of Lake Wales Ridge, they were not indicated by the SWFWMD as potentially affected by SFWMD groundwater withdrawals in its 2018 Priority List and Schedule (SWFWMD 2018) or through the SFWMD analyses in **Chapter 6**.

SUMMARY OF WATER RESOURCE PROTECTION

- In 2011, the FDEP led a statewide initiative to improve consistency in the water use permitting programs implemented by the state's water management districts. The initiative resulted in changes to SFWMD water use permitting rules and criteria, which became effective in 2014 and are listed in the Applicant's Handbook (SFWMD 2015a).
- Development of the Kissimmee River and Chain of Lakes Water Reservations is ongoing and expected to be complete by 2020.
- The LOSA RAA currently prohibits net increases in the volume of surface water withdrawn from Lake Okeechobee and the integrated conveyance systems that are hydraulically connected to and receive water from Lake Okeechobee over that resulting from base condition water uses.
- State funding was provided to assist the USACE in expediting the rehabilitation of the Herbert Hoover Dike. The current Integrated Delivery Schedule (USACE 2018) indicates completion of the Herbert Hoover Dike rehabilitation by 2022. The USACE initiated a revision to the 2008 Lake Okeechobee Regulation Schedule in 2019.
- The Lake Istokpoga/Indian Prairie Canal System RAA prohibits additional surface water allocations from these surface water bodies above existing allocations. Lake Istokpoga also is under an MFL prevention strategy.

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5

Water Source Options

TOPICS

- Surface Water
- Groundwater
- Reclaimed Water
- Water Storage
- Summary of Water Source Options

This chapter presents water source options that could be available through 2040 within the Lower Kissimmee Basin (LKB) Planning Area to accommodate future urban and agricultural growth while still meeting the needs of the natural system. **Chapter 6** presents analyses of the surface water and groundwater conditions. Relatively small growth in water demands is projected for the LKB Planning Area over the planning horizon (**Chapter 2**). Because traditional water resources such as surface water and, to a smaller degree, groundwater in the region are limited by resource protection criteria (**Chapter 4**), alternative water sources are identified and discussed in this chapter. Alternative water supply (AWS) options in the LKB Planning Area include brackish groundwater from the Floridan aquifer system (FAS), reclaimed water, water stored through aquifer storage and recovery (ASR), and stormwater stored in aboveground reservoirs.

This chapter includes descriptions of water source options, current and projected uses, and factors that affect availability for water supply purposes. More detailed information about water treatment technologies and their related costs is provided in the South Florida Water Management District (SFWMD or District) *2016 Water Supply Plan Support Document* (Support Document; SFWMD 2016).

SURFACE WATER

Creeks, lakes, canals, and rivers in the Kissimmee Basin form an integrated water management system that directs surface water flow from the Upper Kissimmee Basin to the Lower Kissimmee Basin and into Lake Okeechobee. The LKB Planning Area's major surface water sources include Lake Istokpoga, the Kissimmee River (C-38 Canal), Fisheating Creek, and Taylor Creek/Nubbin Slough. These surface water features flow into Lake Okeechobee either directly or indirectly with the use of water control structures and pump stations. Restricted Allocation Area (RAA) criteria have been established for the Lake Istokpoga/Indian Prairie Canal System that prohibit additional surface water allocations from these water bodies above existing allocations. RAA criteria also have been established for the Lake Okeechobee Service Area (LOSA) that currently prohibit net increases in the volume of surface water withdrawn from Lake Okeechobee and the integrated conveyance systems that are hydraulically connected to and receive water from Lake Okeechobee over that resulting from base condition water uses. Additional demands are expected to be met with groundwater from the FAS.

Fresh surface water is a primary water source for Public Water Supply (PWS) in the LKB Planning Area. Although the Okeechobee Utility Authority is the only PWS utility in the LKB Planning Area that uses surface water as its main source, it is the largest of the region's utilities. In addition, the Seminole Tribe of Florida's Brighton Reservation water entitlement, as specified in the 1987 Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the SFWMD [Public Law 100-228, 101 Statute 1566, and Chapter 87-292, Laws of Florida, as codified in Section 285.165, F.S.], is accomplished through surface water deliveries from the Indian Prairie Canal System.

Lake Istokpoga and Indian Prairie Canal System


Lake Istokpoga

The Lake Istokpoga Basin covers 607 square miles. Rainfall and tributary inflows, primarily from Josephine Creek and Arbuckle Creek, are the source of surface water flows into Lake Istokpoga, which is the fifth largest lake in Florida, spanning 44 square miles and averaging 4 to 6 feet deep. The lake's water levels are maintained in accordance with the United States Army Corps of Engineers (USACE) regulation schedule (**Figure 4-6**). Outflows from Lake Istokpoga are directed either to the Kissimmee River via the Istokpoga Canal or to Lake Okeechobee through the Indian Prairie Canal System. Surface water from Lake Istokpoga and its associated canals have been a primary water source to meet agricultural irrigation demands in the Indian Prairie Basin and the water entitlement for the Seminole Tribe of Florida's Brighton Reservation.

The Indian Prairie Basin, located in the northeastern corner of Glades County and the southeastern corner of Highlands County, drains the northwestern portions of the Lake Okeechobee watershed. Four canals connect Lake Istokpoga to Lake Okeechobee (**Figure 5-1**): C-39A, C-41A, C-40 (Indian Prairie Canal), and C-41 (Harney Pond Canal). The Istokpoga Canal connects Lake Istokpoga to the Kissimmee River. The District Governing Board adopted RAA criteria in 1981 for the Lake Istokpoga/Indian Prairie Canal System (Subsection 3.2.1.A of the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* [SFWMD 2015]), which prohibit additional surface water allocations from the lake and canal system above existing allocations. The RAA minimizes the potential for District-declared water shortages in the basin during periods of drought and ensures sufficient water for existing allocations and delivery of the Seminole Tribe of Florida's water entitlement for the Brighton Reservation. Since implementing the RAA, additional water demand in the area has been met through water conservation and groundwater allocations, which also are subject to permitting requirements.

The Istokpoga Marsh Watershed Improvement District (IMWID) is located south of Lake Istokpoga (**Figure 5-1**). The IMWID was established in 1962, prior to water management district regulatory requirements. It encompasses approximately 34 square miles (22,000 acres) and has a 28-mile internal canal system that provides water supply and drainage, primarily for agriculture. The IMWID withdraws water from Lake Istokpoga pursuant to an agreement with the SFWMD. Additionally, nearly 16 square miles (approximately 10,000 acres) of agricultural lands within the IMWID have separate SFWMD individual water use permits for various reasons, including use of groundwater wells not covered by the surface water agreement.

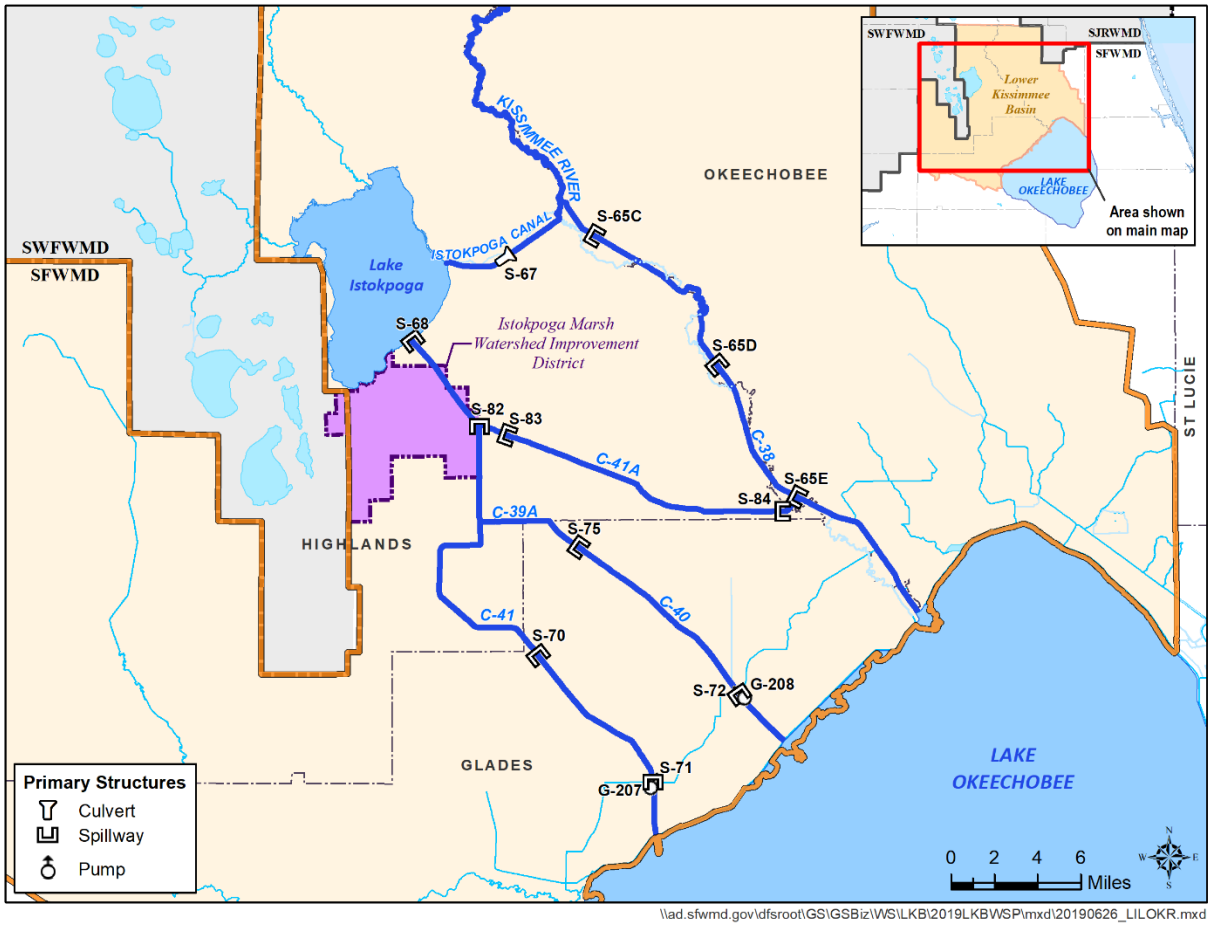

Figure 5-1. Canals and structures connecting Lake Istokpoga, Lake Okeechobee, and the Kissimmee River (C-38 Canal).

Kissimmee River

The Kissimmee River is the longest surface water feature in the LKB Planning Area and contributes close to 50 percent of the total flow to Lake Okeechobee (SFWMD et al. 2011). Historically, the Kissimmee River was 134 miles long; however, channelization as part of the Central and Southern Florida Flood Control Project (C&SF Project) in the 1960s reduced the river to a 56-mile canal (C-38) controlled by a series of locks and structures.

C-38 Canal to Lake Okeechobee

Water released from the headwaters of the Kissimmee River in the Kissimmee Chain of Lakes (part of the Upper Kissimmee Basin Planning Area) flows south through the Kissimmee River Restoration Project, which aims to restore ecological integrity to the Kissimmee River and its floodplain by re-establishing historical hydrology while providing an equivalent pre-project level of flood control in the area. Further detail about the Kissimmee River Restoration Project is provided in **Chapter 7**.

Development of the Kissimmee River and Chain of Lakes Water Reservations has been an ongoing process for several years. The District Governing Board first authorized development of the Kissimmee River and Chain of Lakes Water Reservations in June 2008. The project was postponed and reinitiated twice, in 2009 and 2016, and is currently in progress. The Water Reservations rule is scheduled to be adopted in 2020. The draft Water Reservations propose to reserve the volume of water needed for the protection of fish and wildlife from increased consumptive uses. Further information about the Water Reservations is provided in **Chapter 4**.

Historically, the Kissimmee River has not been used as a water supply source. Due to water needed for environmental purposes in support of the Kissimmee River Restoration Project and the proposed Water Reservations, future water availability from the Kissimmee River will be limited.

Fisheating Creek

Fisheating Creek

Fisheating Creek, west of Lake Okeechobee, marks the southernmost boundary of the LKB Planning Area and is the second largest inflow to Lake Okeechobee. Much of the land surrounding the creek is publicly owned or under conservation easements. The Fisheating Creek Basin originates in western Highlands County and flows south through Cypress Swamp into Glades County. From central Glades County, water leaves the creek channel and flows east through Cowbone Marsh into Lake Okeechobee. Previous studies in the Fisheating Creek watershed have focused on creating water storage and improving water quality discharges to Lake Okeechobee. Fisheating Creek is the only basin with an uncontrolled "natural" discharge to Lake Okeechobee. Currently, Fisheating Creek is not used as a water supply source and is not expected to be used as such in the future.

Taylor Creek/Nubbin Slough

Taylor Creek and Nubbin Slough are interconnected basins that drain into Lake Okeechobee from the north and northeast. Surface water use in the basin is primarily for agriculture, including pasture and dairies. The Nubbin Slough Basin includes three tributaries: Lettuce Creek, Henry Creek, and Mosquito Creek, which, along with Nubbin Slough, are intercepted by the L-63, L-64, and C-59 canals and enter Lake Okeechobee through the S-191 structure. Chandler Hammock Slough is a small tributary in the northern part of the Taylor Creek Basin that allows water to flow eastward into Taylor Creek or westward to Popash Slough and the G-80 structure. Taylor Creek provides drainage to an area just north of the City of Okeechobee, passes through the eastern part of the city, then flows south into the L-63N and C-59 canals and discharges to Lake Okeechobee via the S-191 structure.

Lake Okeechobee

Lake Okeechobee is a key component of the South Florida hydrologic system. It serves multiple purposes, including flood protection; urban, tribal, agricultural, and environmental water supply; navigation; commercial and recreational fisheries; and fish and wildlife habitat. The lake is critical for flood control during wet seasons and water supply during dry seasons. It also is a key ecological component of the Greater Everglades ecosystem.

Lake Okeechobee has multiple inflows, including the Kissimmee River, and receives water from a watershed in excess of 4,600 square miles. The lake's watershed consists of several agricultural irrigation basins surrounding Lake Okeechobee and includes areas southeast of the L-59, L-60, and L-61 canals within the LKB Planning Area. Since 2008, net increases in the volume of surface water withdrawn from Lake Okeechobee and the integrated conveyance systems that are hydraulically connected to and receive water from Lake Okeechobee over that resulting from base condition water uses have been restricted due to Lake Okeechobee Service Area RAA criteria (**Chapter 4**).

Lake Okeechobee

The lake has two major outlets for flood control purposes: one to the east coast via the St. Lucie River (C-44 Canal) and one to the west coast via the Caloosahatchee River (C-43 Canal). Additional limited flood control discharges from Lake Okeechobee to the SFWMD's Lower East Coast Planning Area are possible via the West Palm Beach, Hillsboro, North New River, and Miami canals.

Lake Okeechobee provides water supply to a small portion of the LKB Planning Area throughout the year and is critical for flood control during wet periods. The lake serves as a supplemental water supply source for agriculture when rainfall is insufficient and can be used as a backup source for agricultural areas directly adjacent to the L-59, L-60, and L-61 canals on the north and west sides of the lake during dry periods. Additionally, pump G-207 on the C-41 (Harney Pond) Canal and pump G-208 on the C-40 (Indian Prairie) Canal allow for water deliveries to the southern portion of the basin, which includes the Seminole Tribe of Florida's Brighton Reservation, during periods of drought. The Okeechobee Utility Authority is the only PWS utility using water directly from Lake Okeechobee. Increased withdrawals from the lake are limited due to the adoption of the Lake Okeechobee Service Area RAA criteria by the SFWMD, which was necessitated by the USACE's implementation of the 2008 Lake Okeechobee Regulation Schedule (2008 LORS). Efforts are under way to update the 2008 LORS to a new Lake Okeechobee System Operating Manual (LOSOM) by 2022. The purpose of the LOSOM effort is to re-evaluate and define operations for the Lake Okeechobee regulation schedule that account for additional infrastructure that will be operational in the near future. More information about the LOSOM effort can be found at www.saj.usace.army.mil/LOSOM. Further information about Lake Okeechobee is provided in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018).

GROUNDWATER

Fresh groundwater is a primary water supply source for all water use categories in the LKB Planning Area except PWS, which relies heavily on surface water. Development of groundwater sources may be feasible in some areas within the LKB Planning Area; however, permitting new freshwater supplies will depend on local resource conditions. Based on demand projections in this plan update, groundwater availability appears adequate to meet 2040 demands. Groundwater sources in the LKB Planning Area are fresh groundwater from the surficial aquifer system (SAS), the intermediate aquifer system/intermediate confining unit (IAS/ICU), and the Floridan aquifer system (FAS). The FAS is the primary groundwater source in the region and includes the Upper and Lower Floridan aquifers. The Upper Floridan aquifer has an upper producing zone that contains fresh water and the deeper Avon Park Permeable Zone, which contains brackish water. Water availability from the SAS and IAS in the LKB Planning Area is limited due to low aquifer yields and the limited extent of the IAS within the region. **Figure 5-2** presents a generalized cross-section of these hydrogeologic units within the Upper and Lower Kissimmee Basin planning areas.

Surficial Aquifer System

The SAS, an unconfined aquifer, produces small quantities of good-to-fair quality water within the LKB Planning Area. Regionally, it primarily is used for Domestic and Small Public Supply (DSS), lawn irrigation, and small-scale agricultural uses. The Okeechobee Utility Authority discontinued use of the SAS in December 2016. The water treatment facilities are being maintained for backup and may need to be used for supplemental water in the future to meet projected demand growth. The Seminole Tribe of Florida's Brighton Reservation currently relies on the SAS for Agricultural Irrigation (AGR) and PWS but is in the process of converting to the FAS for PWS use. The SAS wells will be kept for PWS backup wells or used for AGR.

Intermediate Aquifer System/Intermediate Confining Unit

In the LKB Planning Area, the SAS and FAS are separated by the IAS/ICU. While a few locally occurring water-producing zones within the IAS exist in the LKB Planning Area, they generally do not produce large amounts of water. Some wells in southern Okeechobee County and the western portions of the planning area along Lake Wales Ridge have exhibited moderate yields due to local sand beds in the IAS. The confining properties of the IAS are less effective near the ridge due to geologic features that allow an enhanced connection between the SAS and FAS. Overall, the IAS is not seen as a viable source for water supply in the LKB Planning Area due to its low-yielding nature.

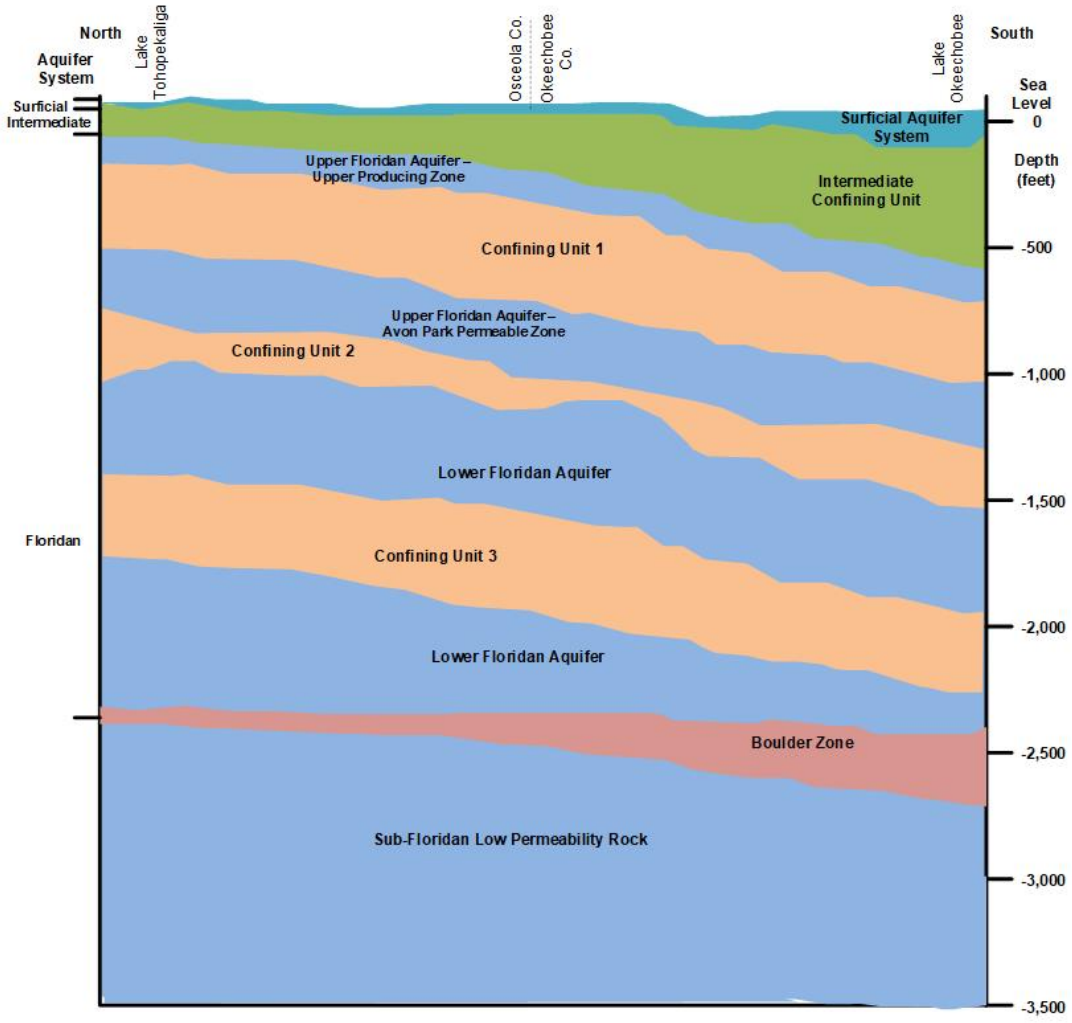

Figure 5-2. Generalized hydrogeologic cross-section (north to south) of the Upper and Lower Kissimmee Basin planning areas.

Floridan Aquifer System

The FAS is a high-yield aquifer system that provides substantial volumes of good-quality water for a wide variety of uses within the LKB Planning Area. The FAS is the most used source in the region and is composed of the Upper Floridan aquifer (UFA) and Lower Floridan aquifer (LFA).

The UFA is a primary source of water for many use categories in the LKB Planning Area. In particular, the UFA is of suitable quality and has demonstrated a high yield sufficient for PWS and AGR demands. Future growth in AGR demands likely will be met primarily with water from the UFA. The UFA is thickest in Glades and Okeechobee counties, averaging more than 1,000 feet. Chloride, total dissolved solids, and sulfate concentrations increase with depth and distance to the south and west. Water quality and aquifer yield deteriorate near Lake Okeechobee. The UFA is further divided by confining units into the Upper Producing Zone and the Avon Park Permeable Zone, which also can vary in water quality and yield.

Water quality within the LFA is saline throughout most of the LKB Planning Area; however, fresh water has been found in the northwestern portion of Highlands County close to Lake Wales Ridge. The production characteristics of the LFA are not well documented, but it is being investigated in the Upper Kissimmee Basin as an AWS, and initial tests indicate the aquifer should be able to yield large quantities of water. Use of the LFA as a water source has been limited in the region due to total dissolved solids levels that generally are too high for crop production and PWS without membrane treatment. Water derived from the brackish portions of the LFA might be useful for blending with other freshwater sources.

RECLAIMED WATER

Reclaimed water is water that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility. The State of Florida encourages and promotes the use of reclaimed water as an AWS option. Reclaimed water can be used for many purposes, including greenspace irrigation, industrial cooling and process water, groundwater recharge, environmental enhancement, and other nonpotable uses.


Reclaimed Water Facilities

The Water Resource Implementation Rule [Chapter 62-40, Florida Administrative Code] requires the Florida Department of Environmental Protection (FDEP) and water management districts to advocate and direct the use of reclaimed water as an integral part of water management programs, rules, and plans. The SFWMD requires all water use permit applicants proposing to use more than 0.10 million gallons per day (mgd) of water and applicants within a mandatory reuse zone, as designated by local governments through ordinance, to use reclaimed water if feasible. In addition, substitution credits and impact offsets, resulting from use of reclaimed water, may be included in a water use permit. A substitution credit is the use of reclaimed water to replace a portion or all of an existing permitted use of a limited surface water or groundwater resource, allowing a different user to initiate or increase withdrawals from the resource. Impact offsets are derived from the use of reclaimed water to reduce or eliminate a harmful impact that has occurred or otherwise would occur as a result of a surface water or groundwater withdrawal.

Wastewater reuse conserves water resources and is an environmentally sound alternative to deep well injection and other traditional disposal methods. Although disposal methods will be needed during wet periods, use of reclaimed water during normal to dry periods minimizes wasteful disposal of water resources. In addition, reclaimed water provides an acceptable alternative to potable water for uses like irrigation, normally at a lower cost.

As of 2019, there are four domestic wastewater treatment facilities in the LKB Planning Area with a capacity of 0.10 mgd or greater (**Appendix D**). The Okeechobee Utility Authority, Okeechobee Correctional Institution, and Sebring Airport report wastewater and reuse flows to the FDEP (2018). In 2017, those facilities treated a total of 1.22 mgd of wastewater and 49 percent was reused. The Seminole Tribe of Florida's Brighton Reservation facility is not

required to report flows to the FDEP. Sebring Airport uses its reclaimed water (0.04 mgd) for spray field irrigation while most of the Okeechobee Utility Authority's reclaimed water (0.33 mgd) was used to irrigate grass, hay, and citrus. The remaining reclaimed water produced by the Okeechobee Utility Authority was used at the plant for irrigation or other internal processes. In 2017, the Okeechobee Correctional Institution used 0.19 mgd of reclaimed water for spray field irrigation.

WATER STORAGE

Storage is an essential component of any water supply system that experiences fluctuations in supply and demand. Capturing surface water and groundwater during wet conditions for use during dry conditions increases the amount of available water. In South Florida, approximately three-quarters of the annual rainfall occurs during the wet season. Without sufficient storage capacity, much of this water is lost through surface water management and flood protection systems. In the LKB Planning Area, potential types of water storage include ASR systems and reservoirs, both of which are considered AWS options.

Aquifer Storage and Recovery

Kissimmee River ASR Facility

ASR involves storing stormwater, surface water, fresh groundwater, potable water, or reclaimed water in an aquifer that has appropriate attributes (e.g., modest transmissivity, intergranular porosity, overlain by a competent confining unit, low ambient water salinity) and subsequently recovering the water when needed. In this process, an aquifer acts as an underground reservoir for injected water. The injected water is treated to appropriate standards, which may vary depending on the water quality of the receiving aquifer, and then pumped into the aquifer through a well (stored). The water is pumped back out (recovered) at a later date and treated for use. The amount of water recovered depends on subsurface conditions, storage time, and water quality. The level of treatment required during recovery depends on the intended use of the water (e.g., public consumption, irrigation, surface water augmentation, wetlands enhancement).

The volume of water made available through ASR depends on several factors, including well yield, water availability, aquifer characteristics, variability in water supply and demand, and use type. There are uncertainties that need to be addressed with the implementation of ASR systems, but this storage option has the potential to retain substantial quantities of water that otherwise would be lost through discharge to the ocean, deep well injection, or evaporation.

To date, two ASR facilities have been constructed and tested within the LKB Planning Area. The facility along the L-63N Canal within Taylor Creek was built and operated by the SFWMD in the 1980s. The USACE built the second facility along the Kissimmee River, just north of Lake Okeechobee, as a Comprehensive Everglades Restoration Plan (CERP) pilot project and tested it from 2010 through 2012. In addition to these early projects, multiple FAS wells have been constructed by utilities (e.g., Okeechobee Utility Authority), the Seminole Tribe of

Florida, and agricultural landowners throughout the planning area that indicate favorable hydrogeologic conditions for ASR development. ASR wells are a component of the Lake Okeechobee Water Restoration Project's Tentatively Selected Plan developed by the USACE and SFWMD. As part of the project, up to 80 ASR wells could be constructed around Lake Okeechobee and will work in tandem with other components such as a wetland attenuation feature. Further information about these projects is provided in **Chapter 7**.

Local and Regional Reservoirs

Surface water reservoirs capture and store water, primarily during wet weather conditions, for use during the dry season. Water typically is captured and pumped from rivers or canals and stored in aboveground or in-ground reservoirs. Small-scale (local) reservoirs are used by agricultural operations for storage of recycled irrigation water or collection of stormwater runoff. These reservoirs may provide water quality treatment before off-site discharge. Large-scale (regional) reservoirs are used for stormwater attenuation, environmental restoration, water quality treatment in conjunction with stormwater treatment areas, and storage of seasonally available water, which may have a water supply component. An example of a regional reservoir in the LKB Planning Area is the 48,000-acre-foot wetland attenuation feature proposed as part of the Lake Okeechobee Watershed Restoration Project Tentatively Selected Plan. In addition, the IMWID recently completed construction of a 308-acre reservoir and pump station that will be used for water quality treatment and water supply for agricultural uses in the area. Operation of the reservoir will begin once electric supply is connected to the pumps. The IMWID also has plans to build a 400-acre reservoir for the same purposes. Construction of the second reservoir is expected to begin in late 2020 and be completed by 2022.

SUMMARY OF WATER SOURCE OPTIONS

The LKB Planning Area relies on surface water and fresh groundwater for urban, agricultural, and industrial uses. Most PWS demand is met by the Okeechobee Utility Authority with surface water from Lake Okeechobee. The other four PWS utilities in the LKB Planning Area rely on fresh groundwater. AGR relies on a combination of surface water and fresh groundwater.

Withdrawals from the SAS primarily are for domestic residential wells and small-scale agricultural uses. The Seminole Tribe of Florida's Brighton Reservation currently relies on the SAS for AGR and PWS but is in the process of converting to the FAS for PWS use. The FAS produces fresh water in much of the LKB Planning Area and is the most used water source. Use of the FAS likely will continue increasing to meet future water demands in the region as it is a practical solution to meet some of the region's AGR needs when surface water availability is limited. Existing and proposed regulatory measures (e.g., Minimum Flows and Minimum Water Levels, RAAs, Water Reservations) limit surface water availability from Lake Istokpoga, the Kissimmee River, and Lake Okeechobee.

Reclaimed water can be used to meet new uses or replace freshwater sources and potable water currently used for irrigation or industrial purposes. Additionally, water storage features such as reservoirs, ASR wells, and impoundments can capture excess stormwater, groundwater, and surface water during wet weather periods and provide supplemental water supply for AGR, PWS, natural systems, and other needs.

Overall, water demands in the LKB Planning Area can continue to be met during 1-in-10 year drought conditions over the planning horizon using traditional sources. Because surface water sources are limited by regulatory constraints, increases in future demands are expected to be met using groundwater, primarily from the UFA.

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6

Water Resource Issues and Analyses

This chapter provides an overview and the status of water resources within the Lower Kissimmee Basin (LKB) Planning Area of the South Florida Water Management District (SFWMD or District) as well as their limitations and ability to meet the projected demands described in **Chapter 2**. The issues identified in this chapter may affect the use of existing water resources and the development of new supplies to meet projected water demands for 2040. Understanding the relationship and effect of meeting water demands through withdrawals from water resources while not causing harm to the water resource and related natural systems is critical to water supply planning. A summary of resource protection tools under Florida law is provided in **Chapter 4**.

TOPICS

- Summary of Issues Identified for 2040
- Evaluation and Analysis
- Climate Change
- Summary of Water Resource Analyses

SUMMARY OF ISSUES IDENTIFIED FOR 2040

Past analyses have concluded groundwater, in conjunction with currently permitted surface water, is adequate to meet existing and future needs of the LKB Planning Area during 1-in-10 year drought conditions. Although water sources appear sufficient to meet projected 2040 demands for this *2019 Lower Kissimmee Basin Water Supply Plan Update* (2019 LKB Plan Update), there are issues, similar to those identified in the previous water supply plan (2014), that affect the availability of water in the LKB Planning Area. The following water supply issues continue to influence water supply planning efforts in the LKB Planning Area:

- Future water needs of the Kissimmee River Restoration Project and the proposed Kissimmee River and Chain of Lakes Water Reservations;
- Regulatory limitations that prohibit additional surface water allocations from Lake Istokpoga and the Indian Prairie Canal System above existing allocations;
- Regulatory limitations that currently prohibit net increases in the volume of surface water withdrawn from Lake Okeechobee and the integrated conveyance systems that are hydraulically connected to and receive water from Lake Okeechobee over that resulting from base condition water uses;

- Continued compliance with the 1987 Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the SFWMD [Public Law 100-228, 101 Statute 1566, and Chapter 87-292, Laws of Florida, as codified in Section 285.165, Florida Statutes] and the implementing agreements;
- The cumulative effects of groundwater withdrawals on Lake Wales Ridge water bodies in the Southwest Florida Water Management District (SWFWMD) that have associated Minimum Flow and Minimum Water Level (MFL) criteria; and
- The effects of climate change, particularly changes in rainfall patterns, including drought and storm frequency and intensity, on agricultural irrigation demands.

EVALUATION AND ANALYSIS

In development of this water supply plan update, data and information from many sources were considered. The following information sources were used to evaluate water resources in the LKB Planning Area, including their availability and ability to meet projected demands considering the issues previously listed:

- Input from planning area stakeholders and the public
- Analyses and modeling results from the *2014 Lower Kissimmee Basin Water Supply Plan* (2014 LKB Plan; SFWMD 2014)
- Water Supply Facilities Work Plans and capital improvement elements from local governments
- Amendments to Work Plans provided by the Seminole Tribe of Florida
- Activities and progress since the 2014 LKB Plan (SFWMD 2014), including water supply diversification
- Water use permits and permit applications
- Water supply demand projections for 2040
- Hydrologic data for the surficial and Floridan aquifer systems (SAS and FAS) from monitoring wells in the LKB Planning Area
- Data and information from the Comprehensive Everglades Restoration Plan (CERP), including status of CERP projects such as the Lake Okeechobee Watershed Restoration Project (LOWRP)
- Analyses performed as part of the 2008 Lake Okeechobee Regulation Schedule (2008 LORS) development

Based on information from the aforementioned sources, it was determined the analyses conducted in support of the 2014 LKB Plan (SFWMD 2014) are still valid for this 5-year plan update. The demand projections, assumptions, and resource protection criteria used in those analyses were reviewed and compared to current information. The projected groundwater demands in this plan update are lower than those previously analyzed; therefore, the 2014 groundwater simulations are considered conservative compared to current and projected scenarios. The SFWMD recognized the findings and conclusions of the previous evaluations and analyses conducted as part of the 2014 LKB Plan (SFWMD 2014) still are representative to address the 2040 projected water demands for the region.

Surface Water Availability

As described in **Chapter 5**, there are several surface water sources in the LKB Planning Area that could be considered to meet water supply needs. Most notably, the Kissimmee River, Lake Okeechobee, Lake Istokpoga, and the Indian Prairie Canal System.

Kissimmee River

Water use from the Kissimmee River to meet consumptive water supply needs is minimal due to limited physical access and seasonal water availability. In addition, major segments of the river are undergoing restoration to return to a pre-channelization state. Once complete, the Headwaters Revitalization component of the Kissimmee River Restoration Project will create additional water storage north of the LKB Planning Area, which will provide the water needed to improve the quantity and timing of the river's inflows and restore floodplain wetlands. Further information about the Kissimmee River Restoration Project is provided in **Chapter 7**. The SFWMD is developing Water Reservations for the Kissimmee River and Chain of Lakes that will identify water needed for the protection of fish and wildlife and reserve it from increased consumptive uses. Adoption of the Water Reservations rule is expected by December 2020. Further information about the Water Reservations rule is provided in **Chapter 4**.

Lake Okeechobee

With the implementation of the 2008 LORS, Lake Okeechobee's MFL status was changed from a water body under prevention to one under recovery. As a result, a recovery strategy was developed, and part of the regulatory component included implementation of Lake Okeechobee Service Area Restricted Allocation Area (RAA) criteria. The RAA covers Lake Okeechobee and the integrated conveyance systems that are hydraulically connected to and receive water from Lake Okeechobee. Net increases in the volume of surface water withdrawn from the RAA are prohibited over that resulting from base condition water use. Allocations over the base condition water use are only allowed through sources detailed in Subsection 3.2.1.F.3.c of the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (SFWMD 2015). Efforts led by the United States Army Corps of Engineers are under way to update the 2008 LORS to a new Lake Okeechobee System Operating Manual by 2022. Further information about the Lake Okeechobee MFL and recovery strategy can be found in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018) and Chapter 40E-8, Florida Administrative Code.

Lake Istokpoga and Indian Prairie Canal System

The District Governing Board adopted RAA criteria in 1981 for the Lake Istokpoga/Indian Prairie Canal System (Subsection 3.2.1.A of the Applicant's Handbook [SFWMD 2015]) that prohibit additional surface water allocations from the lake and canal system above existing allocations. Previous water supply plans evaluated the amount of surface water in Lake Istokpoga and the Indian Prairie Canal System and found that water demands could be met during a 1-in-10 year drought with supplemental groundwater.

Surface Water Supplies to the Seminole Tribe of Florida-Brighton Reservation

The Seminole Tribe of Florida has a surface water entitlement pursuant to the 1987 Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the SFWMD [Public Law 100-228, 101 Statute 1566, and Chapter 87-292, Laws of Florida, as codified in Section 285.165, Florida Statutes]. Generally, the Tribe is entitled to 15 percent of the total amount of water that can be withdrawn from SFWMD canals and borrow canals by all users from surface water within the Indian Prairie Basin, calculated by the SFWMD on a monthly basis. The parties executed subsequent documents addressing the entitlement. The *Agreement Between SFWMD and the Seminole Tribe of Florida and Water Supply Plan for the Brighton Reservation Implementing Section VI.B of the Compact and Subparagraph 3.3.32.A.3 of the Criteria Manual* (Agreement No. C-4121) describes the optimal levels for various canal stretches that would allow the Tribe to withdraw the entitlement and outlines an operational plan for releases from Lake Istokpoga or Lake Okeechobee during normal and water shortage conditions. The *Agreement between the South Florida Water Management District and the Seminole Tribe Providing for Water Quality, Water Supply, and Flood Control Plans for the Big Cypress Seminole Indian Reservations and the Brighton Seminole Indian Reservation, Implementing Sections V.C. and VI.D. of the Water Rights Compact* (usually referred to as the 1996 Agreement) addresses the SFWMD's mitigation responsibilities regarding impacts to the Seminole Tribe of Florida's ability to obtain surface water supplies at the Brighton Reservation.

In support of the 1987 Water Rights Compact and the Tribe's water entitlement, the SFWMD initiated efforts in 2016 to quantify the surface water availability of District-operated canals in the Indian Prairie Basin using a water budget approach for the canals in the basin based on observed data that accounts for discharges into and out of the canals, runoff into and withdrawals from the canals, rainfall, evapotranspiration, and seepage. The SFWMD and Seminole Tribe of Florida currently are discussing the draft results of the quantification effort.

Surface Water and Groundwater Relationships

The relationship between a surface water feature and the underlying groundwater system is based on the hydraulic characteristics of each aquifer and the thickness and type of soils separating the two features. When a river, canal, or wetland has a higher water level than the water table, these surface water bodies provide seepage into the local shallow groundwater system. Conversely, when the water level of the surface water bodies is lower than the water table, groundwater discharge may occur. The rate at which this transfer occurs depends on the difference in these two levels and the permeability and thickness of the materials separating the surface water and groundwater. The SAS primarily is recharged by rainfall and interacts with surface water features such as rivers, canals, wetlands, and lakes. The SAS provides temporary storage for infiltrating water that eventually recharges underlying aquifers or moves laterally to discharge areas. Recharge to the FAS occurs along the central highlands of Florida, including Lake Wales Ridge, north of the LKB Planning Area (**Figure 6-1**). Due to the highly transmissive nature of the FAS, the effects of withdrawals from this aquifer system may extend long distances from the point of withdrawal.

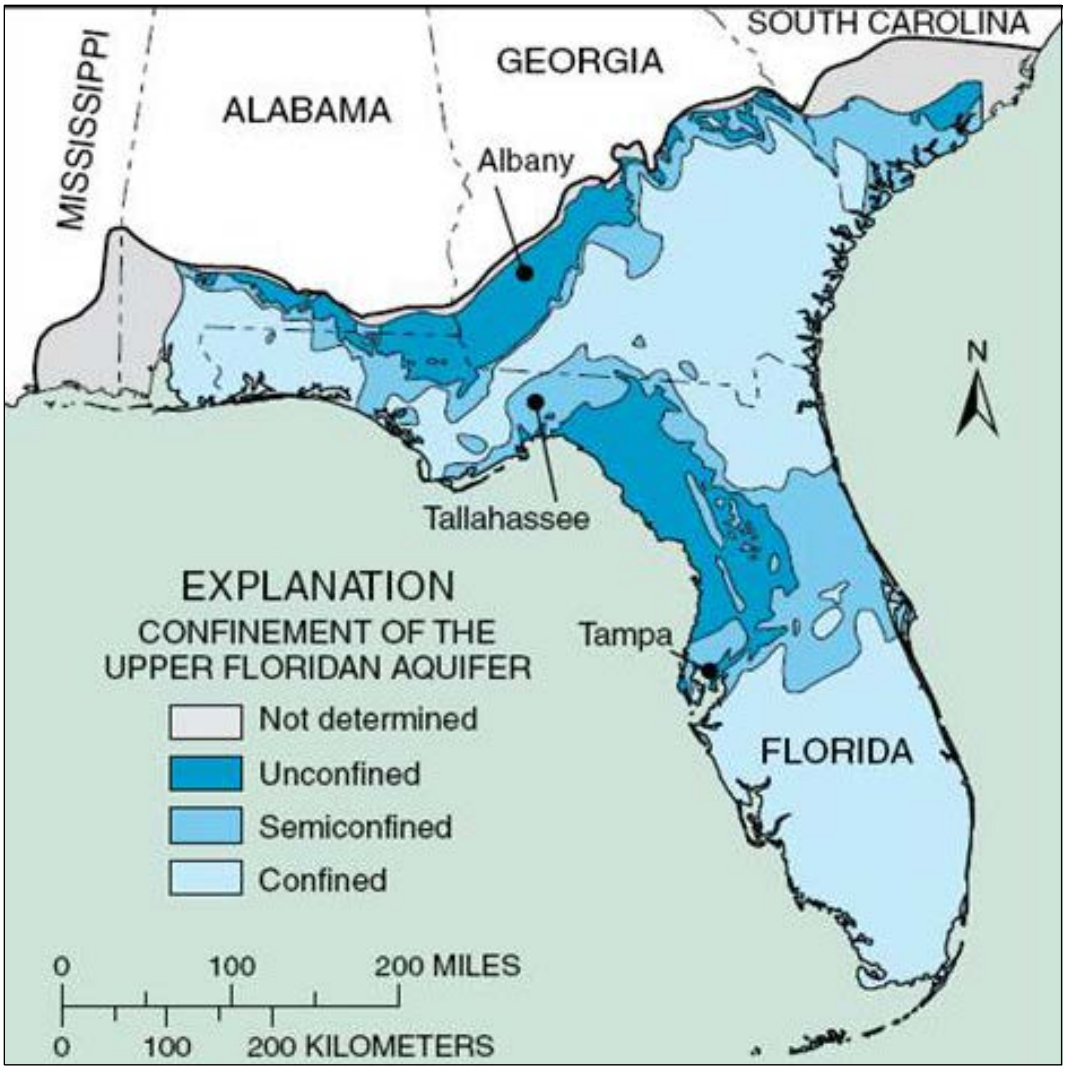

Figure 6-1. Extent and permeability of the Upper Floridan aquifer (From: Marella and Berndt 2005). Recharge occurs where the aquifer is unconfined.

Differences between existing and projected future water demands have been minimal in previous plans and remain so in this water supply plan update. Because of the small projected increases in regional water demands, previous groundwater modeling efforts for the LKB Planning Area determined the potential for increased risk to lakes and wetlands, including areas along Lake Wales Ridge, was minimal. Several lakes along Lake Wales Ridge in Highlands County, such as Lakes Placid, June-in-Winter, and Jackson, which are under the jurisdiction of the SWFWMD, have established MFLs. These lakes may have enhanced connections to the underlying aquifer systems. Due to these connections, increasing water supply withdrawals from the Upper Floridan aquifer (UFA) could affect water levels in the lakes. Further information about these water bodies and their MFLs is provided in **Chapter 4**.

2014 LKB Plan Analysis

As part of the 2014 LKB Plan (SFWMD 2014), water level simulations were conducted for 2010 and 2035 using the Lower Kissimmee Basin Groundwater Model (LKBGWM). The LKBGWM is a steady-state model used to generally predict water levels and flow conditions under various assumptions that do not change with time. The model does not evaluate changes in water quality. Results of the LKBGWM simulations indicated FAS levels beneath SWFWMD's Lake Wales Ridge MFL lakes will not be reduced due to water supply withdrawals in the LKB Planning Area. Therefore, the risk of adversely impacting the MFL recovery and prevention strategies for those lakes as a result of projected demands in the LKB Planning Area is considered low. The risk of impacts to Lake Istokpoga and Lake Okeechobee from increased groundwater use is believed to be minimal due to the small projected increase in groundwater withdrawals and the high degree of confinement between the FAS and the overlying SAS. The LKBGWM and the analysis conducted for the 2010 and 2035 water use conditions are summarized in the *Lower Kissimmee Basin Groundwater Model Update Summary Report* (Butler et al. 2014). The 2035 groundwater demands simulated by the LKBGWM were higher than the projected 2040 groundwater demands in this 2019 plan update. Therefore, the 2014 model results are considered a conservative representation of current and future conditions for this 2019 LKB Plan Update. Impacts to water resources, including SWFWMD's Lake Wales Ridge MFL lakes, are not expected.

Groundwater Availability

As discussed in **Chapter 5**, there are three aquifer systems in the region: the surficial aquifer system (SAS), the intermediate aquifer system/intermediate confining unit (IAS/ICU), and the Floridan aquifer system (FAS). In some locations, these systems are isolated from each other by confining sediment units, while in others they are hydraulically connected. Additionally, in some places, these systems are well connected to surface water features such as lakes and wetlands, but in others they are separated. The LKB Planning Area contains both well-confined aquifers near Lake Okeechobee and more hydraulically connected aquifers adjacent to the Lake Wales Ridge area. Groundwater availability could be limited in certain areas by the production capacity of the aquifer or by declines in water levels under lakes and wetlands as a result of groundwater withdrawals. **Figure 6-2** presents a map of individually permitted wells (not including domestic wells) currently penetrating the various aquifers discussed in this section. In addition, hydrographs from selected monitoring wells from different aquifers are presented to show changes in water levels, if any (**Figure 6-3**). The time period presented for each hydrograph varies based on data availability. A recent analysis by SFWMD staff of groundwater wells in the LKB Planning Area showed that while groundwater levels fluctuate seasonally, few wells (in any aquifer system) exhibit a marked upward or downward trend in water levels.

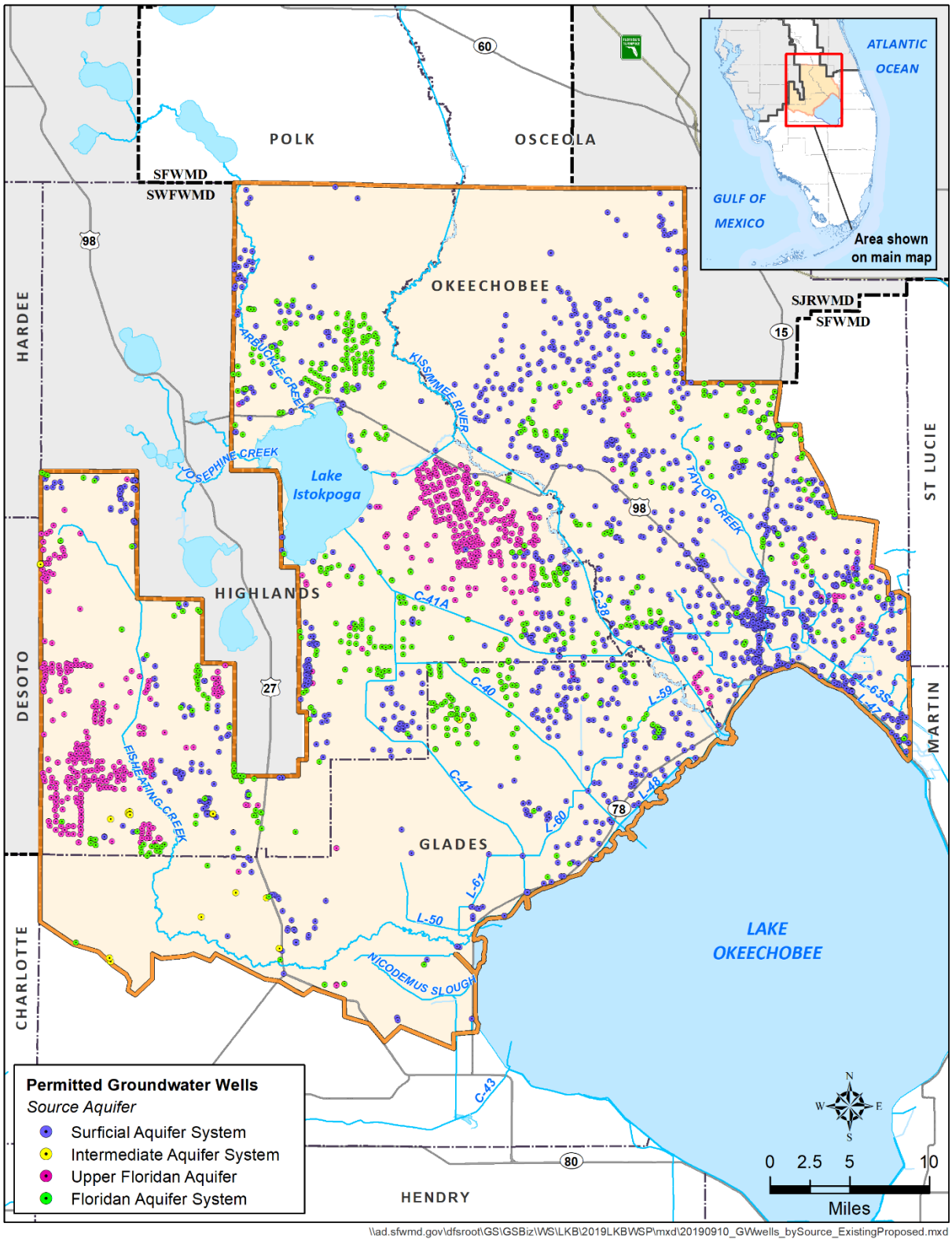

Figure 6-2. Permitted groundwater wells in the LKB Planning Area. (Note: Although part of the Floridan aquifer system, Upper Floridan aquifer wells are identified separately based on more specific well information in the permits.)

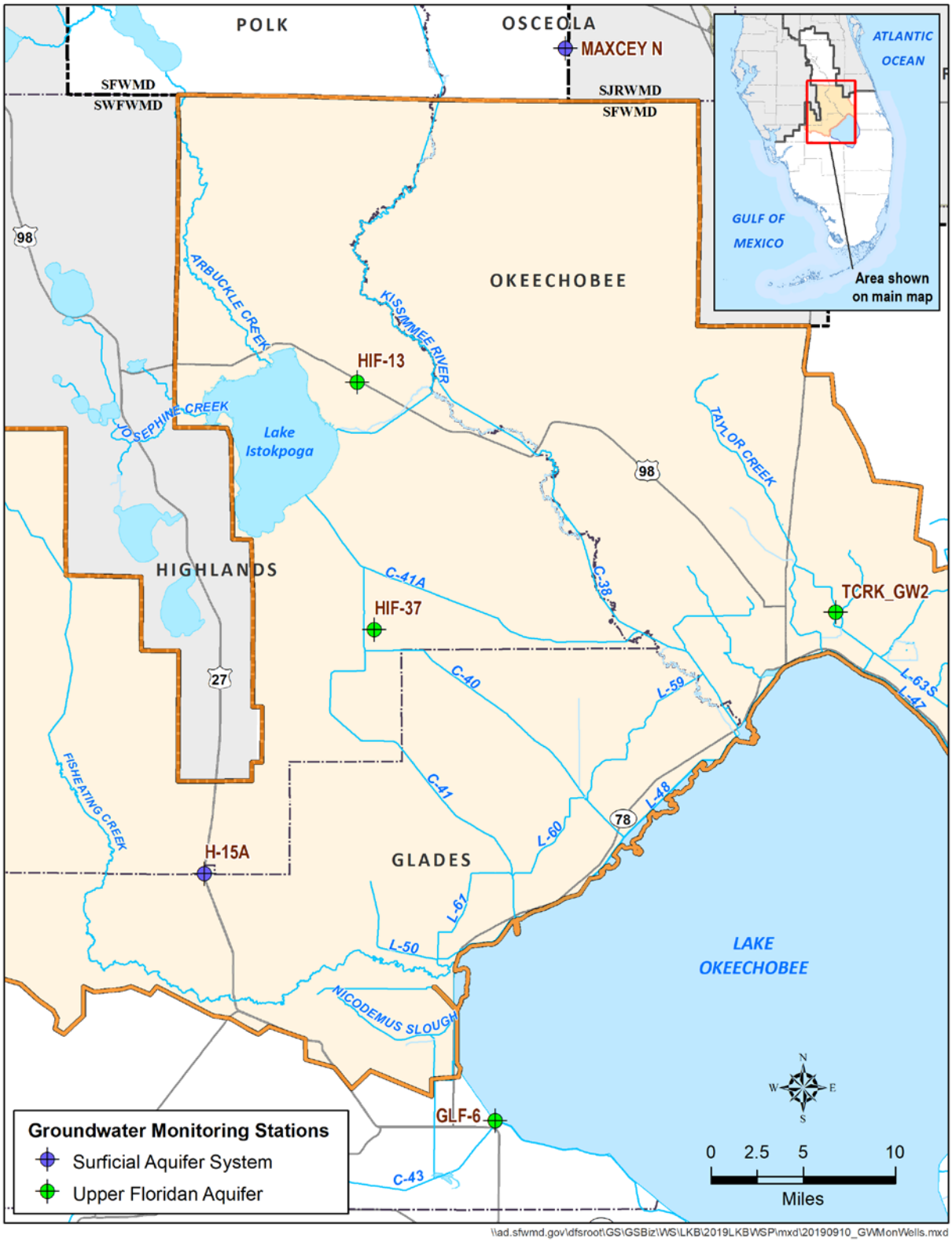

Figure 6-3. Groundwater monitoring wells within and near the LKB Planning Area with data used for analysis in this plan update.

Surficial Aquifer System

Historically, the SAS, including the Water Table aquifer, has been the primary source of potable water and urban irrigation throughout the LKB Planning Area. Public Water Supply (PWS) utilities in the LKB Planning Area currently use both the SAS and FAS as water supply sources but are phasing out use of the SAS in favor of the UFA within the FAS. The SAS is recharged by infiltration from rain and local surface water bodies. Water availability from the SAS is affected by the rate of recharge and limited water movement in the aquifer system, wetland impacts from groundwater withdrawals, proximity to contamination sources, and other existing legal users. **Figure 6-4** shows the relationship between rainfall and SAS groundwater levels near the Sebring Airport. As shown, groundwater levels have remained relatively steady since 2005 and appear highly responsive to local, seasonal rainfall conditions.

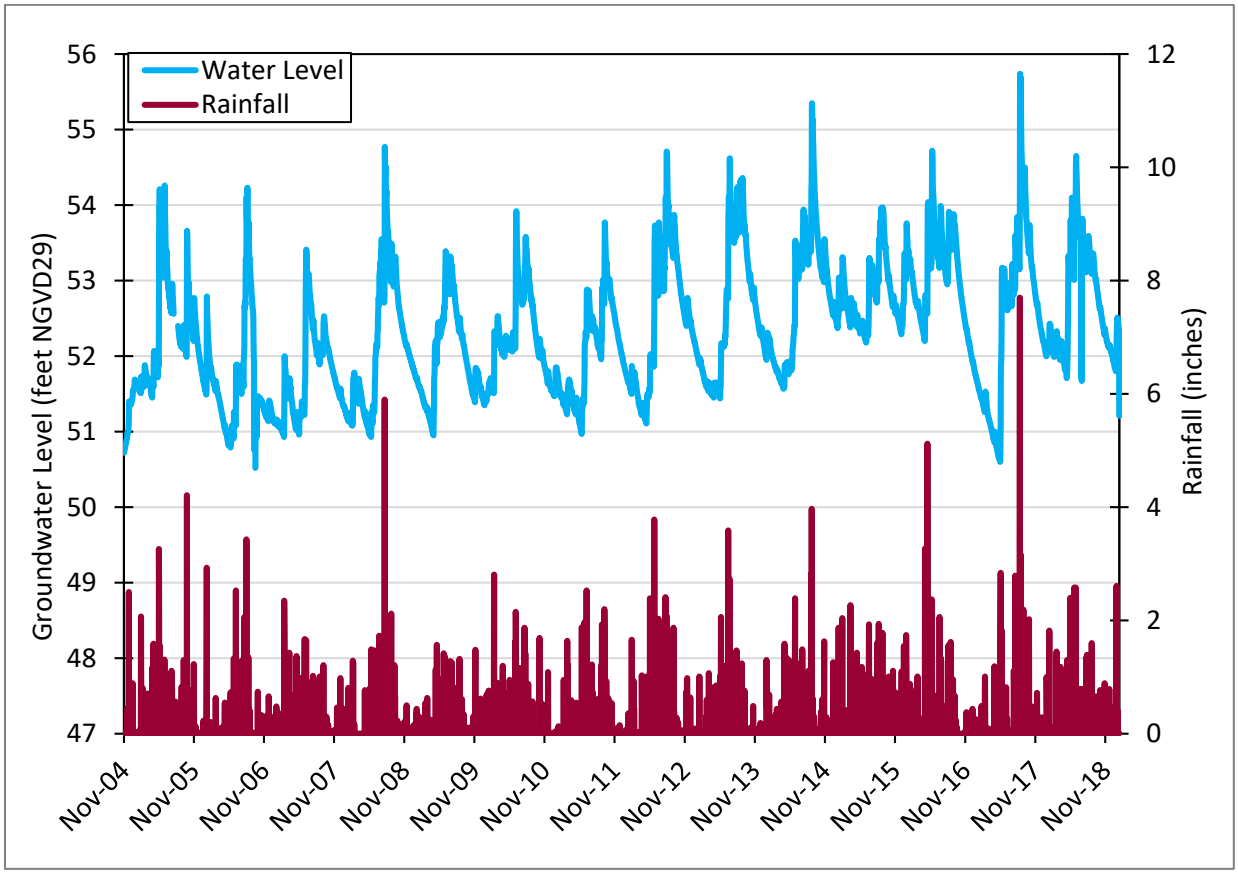

Figure 6-4. Groundwater levels in the surficial aquifer system and rainfall amounts near the Sebring Airport within the LKB Planning Area (2004-2018).

Of the SAS monitoring wells, H-15A on the border of Highlands and Glades counties showed the strongest downward trend in water levels (**Figure 6-5**), while MAXCEY N in Osceola County showed a relatively flat (slightly upward) trend (**Figure 6-6**). However, the maximum fluctuation in H-15A water levels was less than 5 feet. In contrast, MAXCEY N fluctuated more than 9 feet over the period of record.

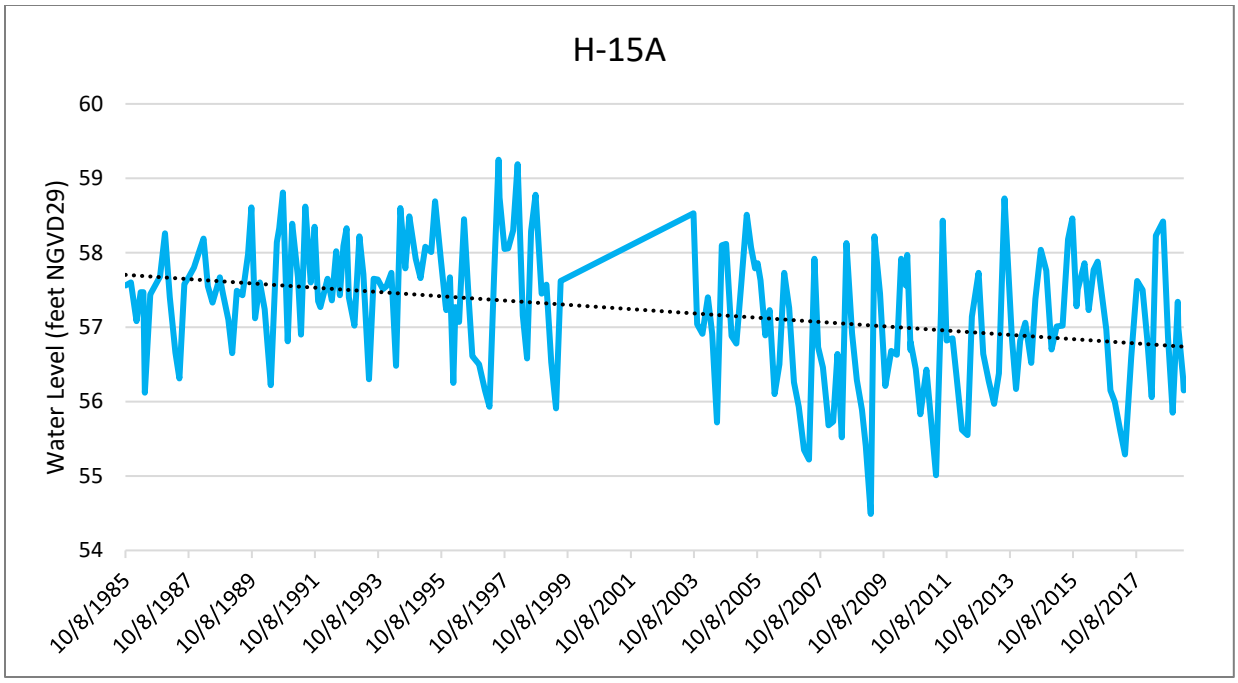

Figure 6-5. Groundwater levels in surficial aquifer system well H-15A in Highlands County (1985-2017).

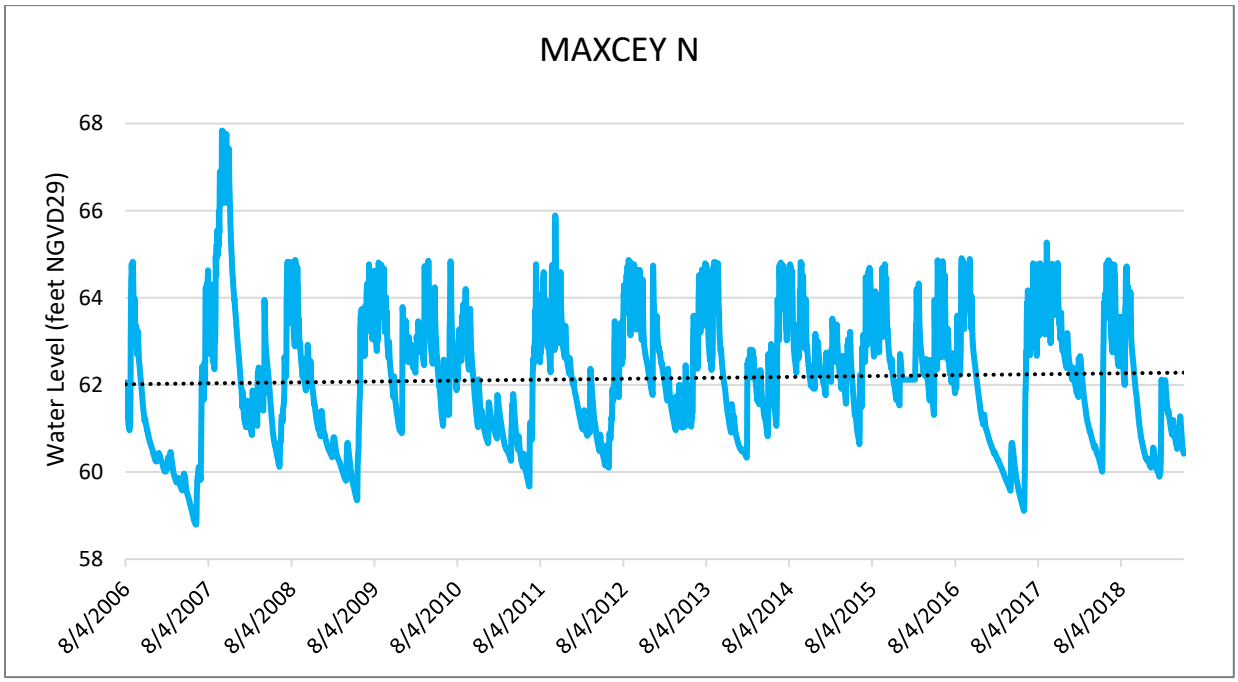

Figure 6-6. Groundwater levels in surficial aquifer system well MAXCEY N in Osceola County (2006-2018).

Intermediate Aquifer System

The IAS/ICU includes all of the rock units that lie between the SAS and the underlying FAS. In the LKB Planning Area, except in portions of western Highlands County, the IAS/ICU primarily acts as a confining layer, restricting vertical movement of water between the SAS and FAS. Due to a lack of geologic data, it is not clear where in Highlands County the transitional boundary of the sediments changes from a confining unit to an aquifer system. As a whole, the entire system, including the water-producing units, has substantially lower permeability than the UFA. However, there are several permitted water users in southwestern Highlands and northwestern Glades counties that use the IAS as a water supply source. Water uses include livestock water supply, aquaculture, landscape irrigation, and small domestic water supply. Where the IAS/ICU is productive, it is a source with moderate yield; well capacities range from 150 to 350 gallons per minute.

Floridan Aquifer System

The FAS is substantially more productive than the SAS and IAS in the LKB Planning Area; however, the water is naturally brackish in deeper portions. Within the FAS, the UFA is a primary source of water for many use categories in the LKB Planning Area and has demonstrated a high yield, with fresh water in the northern part of the planning area. The UFA is thickest in Glades and Okeechobee counties, averaging more than 1,000 feet. Water quality parameters such as chloride, total dissolved solids (TDS), and sulfate concentrations increase with depth and distance to the south, east, and west. Recharge to the FAS occurs along the central highlands of Florida, including Lake Wales Ridge outside the LKB Planning Area. Due to the highly transmissive nature of the FAS, the effects of withdrawals from this aquifer system may extend long distances from the point of withdrawal. The FAS also is under artesian conditions (i.e., the wells flow naturally at land surface), except in the area around Lake Wale Ridges where land surface elevation may be higher than the potentiometric surface of the aquifer.

There is little hydraulic, water level, or water quality data available for the Lower Floridan aquifer (LFA) in the LKB Planning Area. Use of the LFA as a water source historically has been limited in the region due to TDS levels that are too high for crop irrigation and public consumption without membrane treatment. For this alternative water source to be considered for future development, additional drilling and testing will be necessary to determine aquifer characteristics.

Upper Floridan Aquifer Water Levels

A hydrogeologic and water quality investigation of the SAS, IAS, and FAS in Highlands County was completed in 2010 by the USGS. The resulting report, *Hydrogeology and Groundwater Quality of Highlands County, Florida* (Spechler 2010), provides a summary of the historical aquifer conditions in the area. The report discusses long-term statistical water level trends for wells penetrating the UFA. Water levels in one UFA well (HIF-37) located near the intersection of the C-41 Canal and State Road 70 have declined approximately 4 feet since the 1980s. However, water levels in another UFA well (HIF-13) close to Lorida showed no significant water level change in the same time frame. **Figure 6-7** shows the water levels for these two wells during the study's reporting period. A recent analysis by SFWMD staff identified an upward trend in water levels at UFA well GLF-6 in Glades County (**Figure 6-8**)

and a downward trend in UFA well TCRK-GW2 in Okeechobee County (**Figure 6-9**). Understanding the response of the FAS to water supply withdrawals has been and will continue to be an important focus of the SFWMD's drilling and testing program as well as regional groundwater modeling efforts.

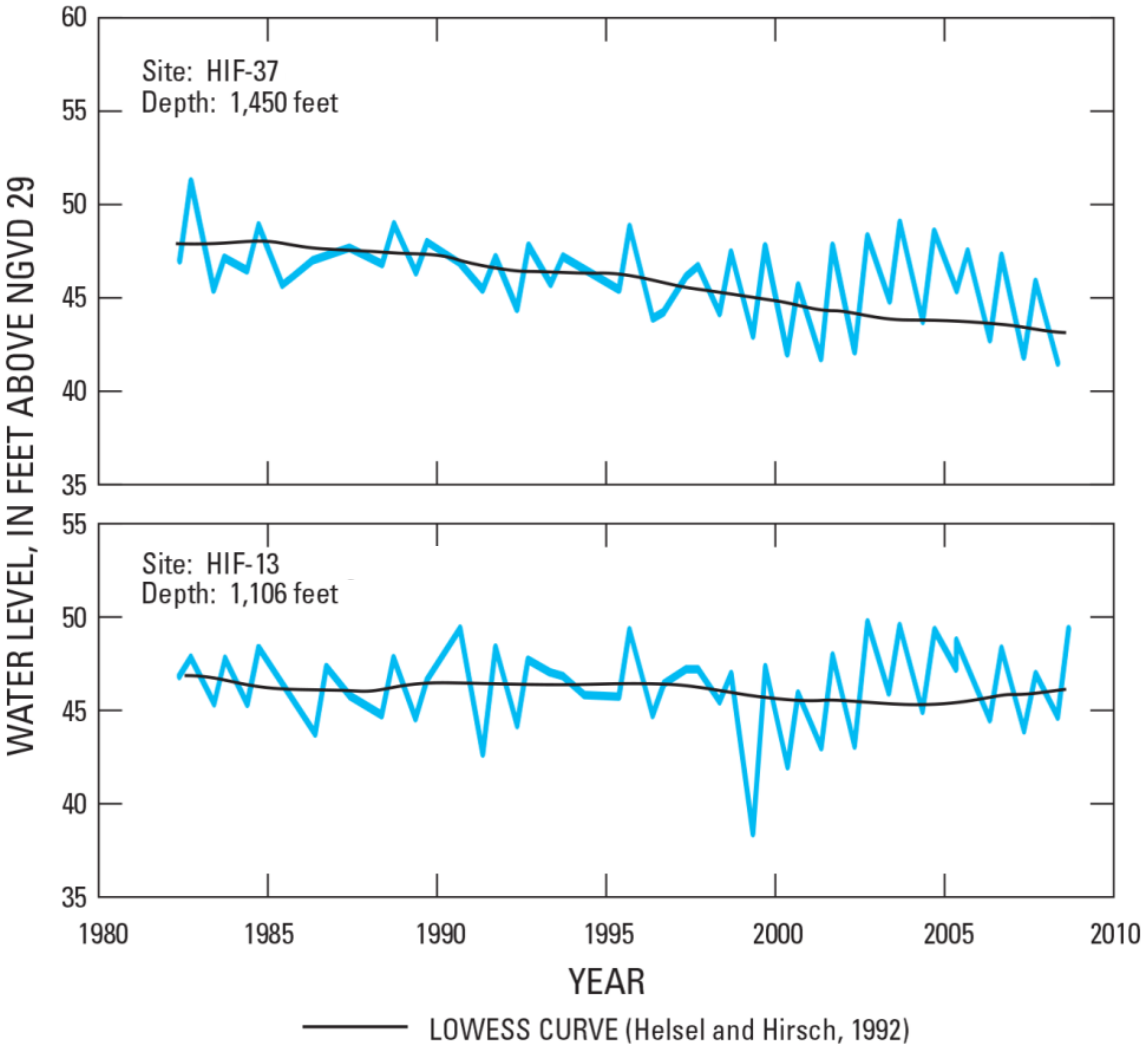

Figure 6-7. Water levels in two Upper Floridan aquifer monitoring wells in the LKB Planning Area; HIF-37 near State Road 70 and HIF-13 near Lorida in Highlands County (1982-2008) (Modified from: Spechler 2010).

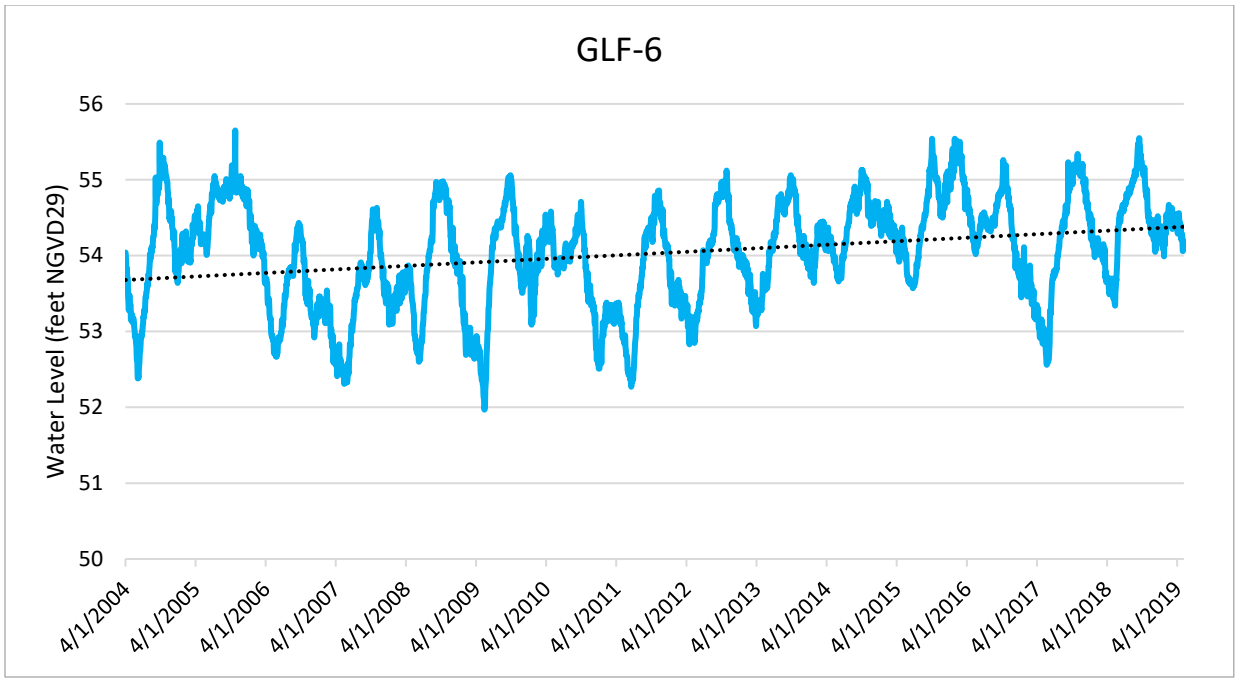

Figure 6-8. Groundwater levels in Upper Floridan aquifer well GLF-6 (depth: 1,560 feet) in Glades County (2004-2019).

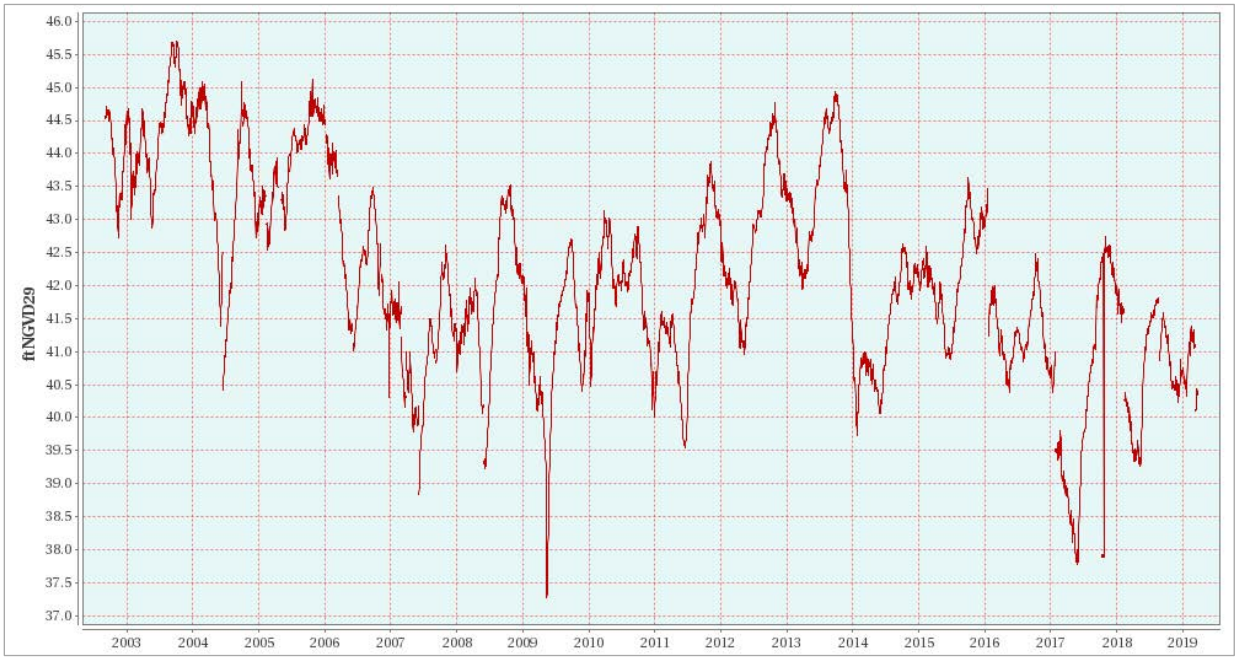

Figure 6-9. Groundwater levels in Upper Floridan aquifer well TCRK-GW2 (depth: 1,700 feet) in Okeechobee County (2003-2019).

Upper Floridan Aquifer Water Quality

Most water withdrawn from the FAS comes from the UFA because it is less mineralized than water from the LFA. Overall, water quality in the UFA is suitable for PWS and agricultural irrigation; however, high TDS concentrations in some areas of the planning region have

limited use of the UFA. Chloride and sulfate concentrations as well as water hardness may require advanced treatment prior to use, which adds to operating costs for utilities and agricultural operations. **Figure 6-10** presents generalized chloride concentration gradients throughout the SFWMD. More detailed, long-term data for the LKB Planning Area currently are not available to make conclusive statements about water quality trends in the region.

As discussed in the 2014 LKB Plan (SFWMD 2014), TDS concentrations in the UFA generally have remained stable; however, TDS concentrations within the aquifer are geographically variable. Large-scale uses withdrawing from the UFA need to be carefully evaluated, designed, and operated to minimize the potential for water quality degradation over time due to saline water migration and possible cross-contamination between aquifers.

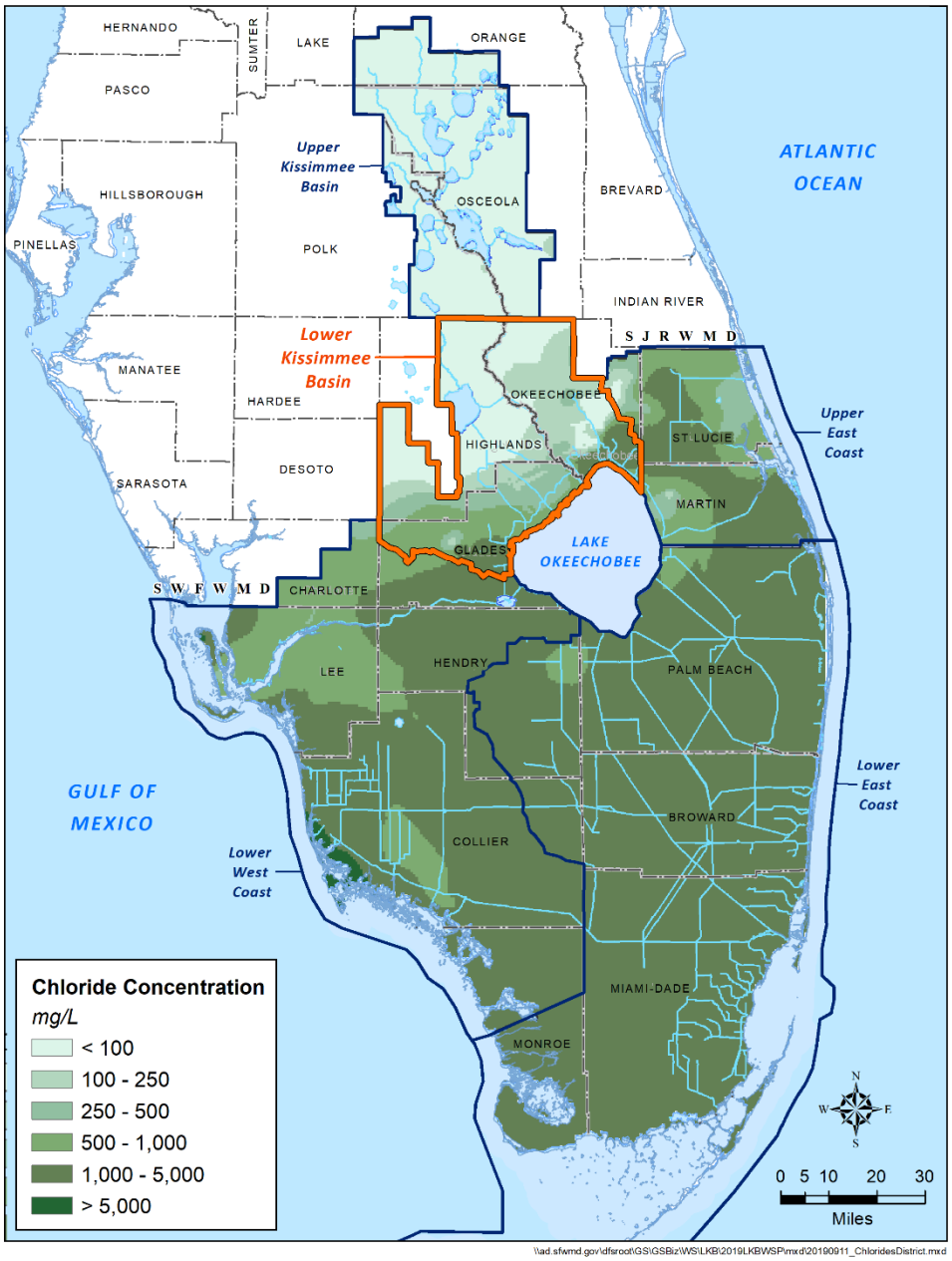

Figure 6-10. Chloride concentrations in the Upper Floridan aquifer.

CLIMATE CHANGE

Because a reliable and economical supply of water is necessary for a strong Florida economy, climate change and its effects on hydrologic conditions are considered in water supply planning. Increased air temperatures and changes in precipitation regimes and storm frequency associated with climate change could result in greater evaporation, longer drought periods, and higher risk of flooding throughout South Florida. Long-term data and modeling have been used to predict changes to air temperatures, weather patterns (including the frequency and intensity of rain), droughts, evapotranspiration rates, stream flow, sea level, and other parameters that will affect water availability and water quality. Florida is especially vulnerable to the effects of climate change and sea level rise due to its low topography and extensive shoreline.

The SFWMD is responsible for managing and protecting the water resources of South Florida by balancing and improving flood control, water supply, water quality, and natural systems. Over the last decade, the SFWMD has implemented strategies to adapt its operations to ensure its mission elements continue to be met under changing climate conditions. The SFWMD's approach centers on staying current with the science of climate change and applying actionable and reliable science to planning and operations. The efforts to address its mission elements require collaboration and cooperation with local and tribal governments; other regional, state, and federal agencies; universities; nongovernmental entities; a wide array of stakeholders; and concerned citizens throughout South Florida. Coordination is essential because effective solutions and adaptation strategies require action across multiple agencies and administrative boundaries.

The combination of sea level rise and potential changes in temperature, rainfall patterns, and tropical storm activity likely will alter how the SFWMD achieves its legislatively mandated mission elements—to operate and maintain the regional water management infrastructure, provide flood control and water supply benefits to Florida citizens, and protect and restore natural systems. The agency approach is focused less on the causes of climate change and more on understanding the implications climate change may have on water resources and future water supply sources as well as determining how to respond and deliver its mission elements through planning, proactive action, and adaptive management.

Current predictions, from multiple climate models summarized by the Intergovernmental Panel on Climate Change, indicate global mean surface temperatures likely will increase over the next 20 years, leading to longer and more frequent heat waves over land areas (Southeast Florida Regional Climate Change Compact 2015). This would increase evaporation, resulting in lower surface water levels, increased irrigation demand, and impacts to stormwater runoff, soil moisture, aquifer recharge, and water quality.

More frequent, intense rainfall events with longer interim dry periods could increase total annual rainfall but decrease effective rainfall (i.e., aquifer recharge) as more water may be lost to runoff, prompting the need for increased storage alternatives. In addition, climate change can cause longer interim dry periods, which would increase the need for supplemental irrigation.

Analyses of the results of climate models for Florida suggest a reasonable range for percent change in average annual rainfall is ±5 percent for 2040. Additional studies are under way to determine more precise estimates of future rainfall conditions for planning purposes. The corresponding temperature range for 2040 is +0.5°C to +1.5°C. Several ongoing research studies are focusing on the implications of future temperature changes on evapotranspiration losses. The SFWMD has conducted and commissioned studies on the predictive skills of climate models and has downscaled climate models for Florida. These activities indicate a need for ongoing efforts to improve regional models. The SFWMD is monitoring the findings of these studies and will incorporate results into planning and operations, as appropriate.

The SFWMD has been evaluating climate change since 2008 to determine the best short- and long-term strategies to address water resource management and prepare for related impacts (SFWMD 2009, 2011). Long-established monitoring networks of rainfall and surface water flow data, many with real-time electronic reporting, provide continuous data to monitor changes in local hydrology. In addition, an extensive network of surface water and groundwater monitoring sites enable SFWMD staff to collect and analyze water level and quality data.

Future water supply and stormwater management analyses require the use of rainfall pattern estimates. Currently, this area of climate science is lagging in Florida, and there is no reliable information on how future rainfall patterns may change in South Florida. The SFWMD, in coordination with partners in the private sector and academia, is developing future rainfall intensity-duration-frequency scenarios, rainfall probability analyses, and extreme weather events projections that will be considered in future updates of this water supply plan.

SUMMARY OF WATER RESOURCE ANALYSES

The findings and conclusions of the 2014 LKB Plan (SFWMD 2014) continue to represent the issues considered to meet the 2040 projected water demands in the LKB Planning Area. The following are findings regarding the availability of water resources within the LKB Planning Area to meet the projected 2040 water demands:

- Surface water and fresh groundwater will remain primary sources for existing urban (including PWS) and agricultural uses, and in combination, are adequate to meet the current and projected water needs of the LKB Planning Area. Expansion of surface water withdrawals is limited due to resource constraints, though there is potential for construction of small, local reservoirs.
- Water Reservations for the protection of fish and wildlife are under development for the Kissimmee River and Chain of Lakes that propose restricting increased consumptive uses from these water bodies.
- Surface water withdrawals from Lake Okeechobee and the integrated conveyance systems that are hydraulically connected to and receive water from Lake Okeechobee currently are restricted due to Lake Okeechobee Service Area RAA criteria.
- Efforts led by the United States Army Corps of Engineers are under way to update the 2008 LORS to a new Lake Okeechobee System Operating Manual by 2022.

- Lake Istokpoga is protected by an MFL and the Lake Istokpoga/Indian Prairie Canal System RAA (Subsection 3.2.1.A of the Applicant's Handbook [SFWMD 2015]). The RAA prohibits additional surface water allocations from the lake and canal system above existing allocations.
- The monitoring networks used for aquifer assessment and groundwater modeling are a hybrid of regional monitoring and monitoring required by or performed by regulatory programs. Efforts should be made to identify 1) wells considered critical to long-term monitoring to ensure these wells are maintained or replaced as necessary, and 2) new well locations where hydrogeologic and hydrologic data are lacking.
- Changes in climate conditions, including the frequency and severity of storms and droughts, could affect water demands for agricultural irrigation in the region.

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7

Water Resource and Supply Development Projects

This chapter addresses the roles of the South Florida Water Management District (SFWMD or District) and other parties in water resource development projects and provides a summary of projects in the Lower Kissimmee Basin (LKB) Planning Area. Water supply development projects are briefly discussed at the end of the chapter. The efforts presented in this chapter reflect current budget categories the SFWMD uses for funding new and ongoing water resource development projects. This chapter was created using the Fiscal Year (FY) 2019 Districtwide water resource budget and includes schedules and costs for FY2019 to FY2023. Additional detail on the status of these projects can be found in Volume II – Chapter 5A (Demonstranti 2019) of the *2019 South Florida Environmental Report* (SFER).

TOPICS

- Regional Groundwater Modeling
- Districtwide Water Resource Development Projects
- Kissimmee River Restoration Project
- Comprehensive Everglades Restoration Plan
- Dispersed Water Management Program
- Northern Everglades and Estuaries Protection Program
- Water Supply Development Projects
- Summary of Water Resource and Supply Development Projects

Florida water law identifies two categories of activities to meet water needs: water resource development and water supply development. Water resource development is defined in Section 373.019(24), Florida Statutes (F.S.), as:

> *…the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and groundwater data; structural and non-structural programs to protect and manage water resources; development of regional water resource implementation programs; construction, operation, and maintenance of major public works facilities to provide for flood, surface, and underground water storage and groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities.*

Most water resource development activities in the SFWMD support and enhance water supply development but do not directly yield specific quantities of water. Instead, these projects are intended to assess the availability of an adequate water supply for existing and future uses, including maintaining the functions of natural systems. For example, project-related hydrologic investigations as well as groundwater monitoring and modeling provide important information about aquifer characteristics (e.g., hydraulic properties, water quality), which are useful for appropriate facility design, identifying safe aquifer yields, and evaluating the economic viability of projects, but do not increase water availability.

Water supply development projects generally are the responsibility of water users (e.g., utilities) and involve the water source options described in **Chapter 5** to meet specific needs. These projects often include construction of wellfields, water treatment plants, distribution lines, reclaimed water facilities, and storage systems.

Water resource planning in the LKB Planning Area is influenced by the Comprehensive Everglades Restoration Plan (CERP). Authorized by the United States Congress in 2000, CERP builds on and complements other state and federal initiatives to revitalize South Florida's ecosystems. These efforts have multiple implementation phases, which are supported by water resource development activities such as modeling, land acquisition, project controls, and technical services. CERP efforts are described in this chapter and in the 2019 SFER (SFWMD 2019).

REGIONAL GROUNDWATER MODELING

The SFWMD funds development and application of numerical models for evaluation of groundwater and surface water resources in the District's five planning areas. The models support development of regional water supply plans, Minimum Flows and Minimum Water Levels (MFLs), Water Reservations, and other projects benefitting water resources. Regional groundwater flow models simulate the rate and direction of water movement through the subsurface. Such models include the major components of the hydrologic cycle and are used in water supply planning to understand the effects of current and future water use.

East Central Floridan Transient Expanded Model

Groundwater withdrawals are anticipated to increase with growing demand for water and limited availability of surface water sources throughout South Florida. The East Central Floridan Transient Expanded (ECFTX) model is a groundwater flow model of the surficial and Floridan aquifer systems (SAS and FAS). The model area spans from the Gulf of Mexico to the Atlantic Ocean and extends from the Marion-Lake county line south to the Highlands-Glades county line, including most of the LKB Planning Area. Once the model is completed and calibrated, it will be used to evaluate potential changes to regional conditions of the SAS and FAS within the model area. The model is anticipated to be available for simulations of current and future demand scenarios by 2020 and implemented in the 2020 Central Florida Water Initiative water supply plan update.

DISTRICTWIDE WATER RESOURCE DEVELOPMENT PROJECTS

Water resource development projects encompassing more than one planning area generally are considered Districtwide projects. **Table 7-1** summarizes the estimated costs and time frames for completion of Districtwide water resource development projects. **Table 7-1** does not include other programs, such as CERP, that have their own budgets and primarily are ecosystem restoration projects. The following categories are types of Districtwide water resource development projects:

- MFL, Water Reservation, and Restricted Allocation Area (RAA) rule activities
- Comprehensive Water Conservation Program
- Alternative water supply
- Drilling and testing
- Groundwater assessment
- Groundwater, surface water, and wetland monitoring

Table 7-1. Fiscal Year 2018-2019 through Fiscal Year 2022-2023 implementation schedule and projected expenditures (including salaries, benefits, and operating expenses) for water resource development activities within the SFWMD. All activities are ongoing unless noted otherwise (Modified from: Demonstranti 2019).

Regional Water Activities	Plan Implementation Costs ($ thousands)					Total
	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	
Water Supply Planning	1,159	1,344	1,344	1,344	1,344	**6,535**
CFWI Water Supply Planning Project	2,998	541	541	541	541	**5,162**
Comprehensive Plan, Documents Review, and Technical Assistance to Local Governments	211	206	206	206	206	**1,035**
Water Supply Implementation	228	252	252	263	252	**1,247**
Subtotal	**4,596**	**2,343**	**2,343**	**2,354**	**2,343**	**13,979**
Districtwide Water Activities						
MFL, Water Reservation, and RAA Activities	304	380	380	380	380	**1,824**
Comprehensive Water Conservation Program	287[a]	351	351	311	351	**1,651**
Cooperative Funding Program	51[a]	64	0	0	0	**115**
Groundwater Monitoring	1,416	1,450	1,450	1,450	1,450	**7,216**
Groundwater Modeling	739	775	775	775	775	**3,839**
Estimated portion of C&SF Project Operation & Maintenance budget allocated to Water Supply[b]	110,904	110,904	110,904	110,904	110,904	**554,520**
Subtotal	**113,701**	**113,924**	**113,860**	**113,820**	**113,860**	**569,165**
Total	**118,297**	**116,267**	**116,203**	**116,174**	**116,203**	**583,144**

C&SF Project = Central and Southern Florida Flood Control Project; CFWI = Central Florida Water Initiative; MFL = Minimum Flow and Minimum Water Level; RAA = Restricted Allocation Area; SFWMD = South Florida Water Management District.

[a] These prior initiatives are still under way, and future discussions on funding allocations for the cooperative funding initiatives will be included in the next fiscal year budget development process.

[b] Approximated based on 50 percent of the Fiscal Year 2018-2019 Operation & Maintenance budget.

MFL, Water Reservation, and RAA Rule Activities

MFLs, Water Reservations, and RAA rules as well as other water resource protection measures have been developed to ensure the sustainability of water resources within the SFWMD. For information on MFLs, Water Reservations, and RAAs, see **Chapter 4**, which summarizes the rules in effect as of 2019. Additional information can be found in **Appendix C**.

Comprehensive Water Conservation Program

The long-standing conservation goal of the SFWMD is to prevent and reduce wasteful, uneconomical, impractical, or unreasonable uses of water resources. This is addressed through planning; regulation; use of alternative sources, including reclaimed water; public education; and demand reduction through conservation technology, best management practices, and water-saving funding programs. The Comprehensive Water Conservation Program is a series of implementation strategies designed to create an enduring conservation ethic and permanent reduction in water use. The program is discussed further in **Chapter 3**. Additional information can be found in the *2016 Water Supply Plan Support Document* (SFWMD 2016).

Alternative Water Supply

Alternative water supply (AWS) projects and source diversification are important supplements to traditional water sources in order to meet current and future water needs Districtwide. In 2016, the SFWMD combined funding programs for stormwater, alternative water supply, and water conservation projects into one streamlined effort, the Cooperative Funding Program. AWS funding helps water users develop reclaimed water projects, water reclamation facilities, brackish water wellfields, reverse osmosis treatment facilities, stormwater capture systems, and aquifer storage and recovery (ASR) well systems. A full description of AWS-related projects and associated funding is contained in the SFWMD's Alternative Water Supply Annual Reports, prepared pursuant to Section 373.707(7), F.S., and published in annual updates of the SFER. Further information about AWS options (e.g., ASR systems, reservoirs) is provided in **Chapter 5**.

Drilling and Testing

Drilling and testing include the installation of wells for short- to long-term monitoring of aquifer water levels and water quality. This work includes drilling and well construction, geophysical logging, pump tests, sediment analysis, and lithologic descriptions. Knowledge of South Florida hydrogeology is enhanced through construction of exploratory/test wells and has improved the accuracy of the SFWMD's groundwater modeling and decision-making regarding approval of water use permits.

Groundwater Assessment

Groundwater assessment includes results of drilling and testing programs as well as development of hydrostratigraphic maps and saltwater interface maps (for the coastal water supply planning areas). In the LKB Planning Area, the SFWMD recently conducted geophysical seismic characterization of the FAS near Lake Okeechobee to complement existing knowledge in support of using subsurface storage options to reduce harmful discharges to estuaries.

Groundwater, Surface Water, and Wetland Monitoring

Water level and water quality monitoring provides critical information for developing groundwater models, assessing groundwater conditions, and managing groundwater resources. The SFWMD maintains extensive groundwater monitoring networks and partners with the United States Geological Survey (USGS) to provide additional support for ongoing monitoring. Data are archived in DBHYDRO (the SFWMD's corporate environmental database), which stores hydrologic, meteorologic, hydrogeologic, and water quality data. The USGS also monitors, archives, and publishes data annually.

Districtwide groundwater monitoring activities include the following:

- **USGS contract for water level monitoring –** An ongoing effort by the USGS with funding support from the SFWMD to collect groundwater level monitoring data. The project includes well and recorder maintenance as well as archiving data in a USGS database for sites throughout the SFWMD. Real-time and periodic data can be accessed through a map interface (https://www.sflorida.er.usgs.gov/ddn_data/index.html).
- **Groundwater monitoring –** An ongoing effort by the SFWMD to monitor groundwater levels throughout the District. As of 2019, Districtwide monitoring includes 604 active SFWMD groundwater stations for the SAS, intermediate aquifer system, and FAS as well as an additional 298 USGS groundwater stations. Data are collected, analyzed, validated, and archived in DBHYDRO.
- **Regional FAS well maintenance –** Water level and water quality monitoring is ongoing at 102 FAS well sites in the SFWMD, as of 2019. Well maintenance is conducted as needed.
- **Hydrogeologic database improvements –** Backlogged data are uploaded, and miscellaneous database corrections are made.
- **Monthly groundwater level measurements –** Continued water level monitoring, including data collection, analysis, and validation, at select sites to supplement the existing groundwater level network.

KISSIMMEE RIVER RESTORATION PROJECT

The Kissimmee River Restoration Project aims to restore ecological integrity to a portion of the Kissimmee River and its floodplain by re-establishing historical hydrology while providing an equivalent pre-project level of flood control in the area (**Figure 7-1**). The Kissimmee River Headwaters Revitalization Project, jointly authorized with the Kissimmee River Restoration Project, will change the regulation schedule for the S-65 structure at the outlet of Lake Kissimmee to allow additional water storage in Lakes Kissimmee, Cypress, and Hatchineha. This additional storage is needed to provide sufficient flow for successful restoration of the Kissimmee River and its floodplain. Coupled with appropriate water management, the new schedule will improve the quantity and timing of inflow to the Kissimmee River. The regulation schedule modifications also are expected to increase the quantity and quality of shoreline habitat in the Headwater Lakes for the benefit of fish and wildlife. Restoration and protection efforts are focused on the section of the river between the S-65A and S-65D water control structures. To date, continuous water flow has been

re-established to 24 miles of the original river, along with intermittent inundation of the floodplain by backfilling a central section of the C-38 Canal. When complete, the project will re-establish flow to approximately 40 miles of historical river channel and restore almost 25,000 acres of floodplain wetlands. After construction is complete and the project is fully implemented, water will be released from the Headwater Lakes as part of a management strategy to balance the water needs of the Kissimmee River and floodplain, the Headwater Lakes, flood control, and the timing of flows into Lake Okeechobee. The project will not change the volume of water moving into Lake Okeechobee but may improve the quality and timing of incoming water.

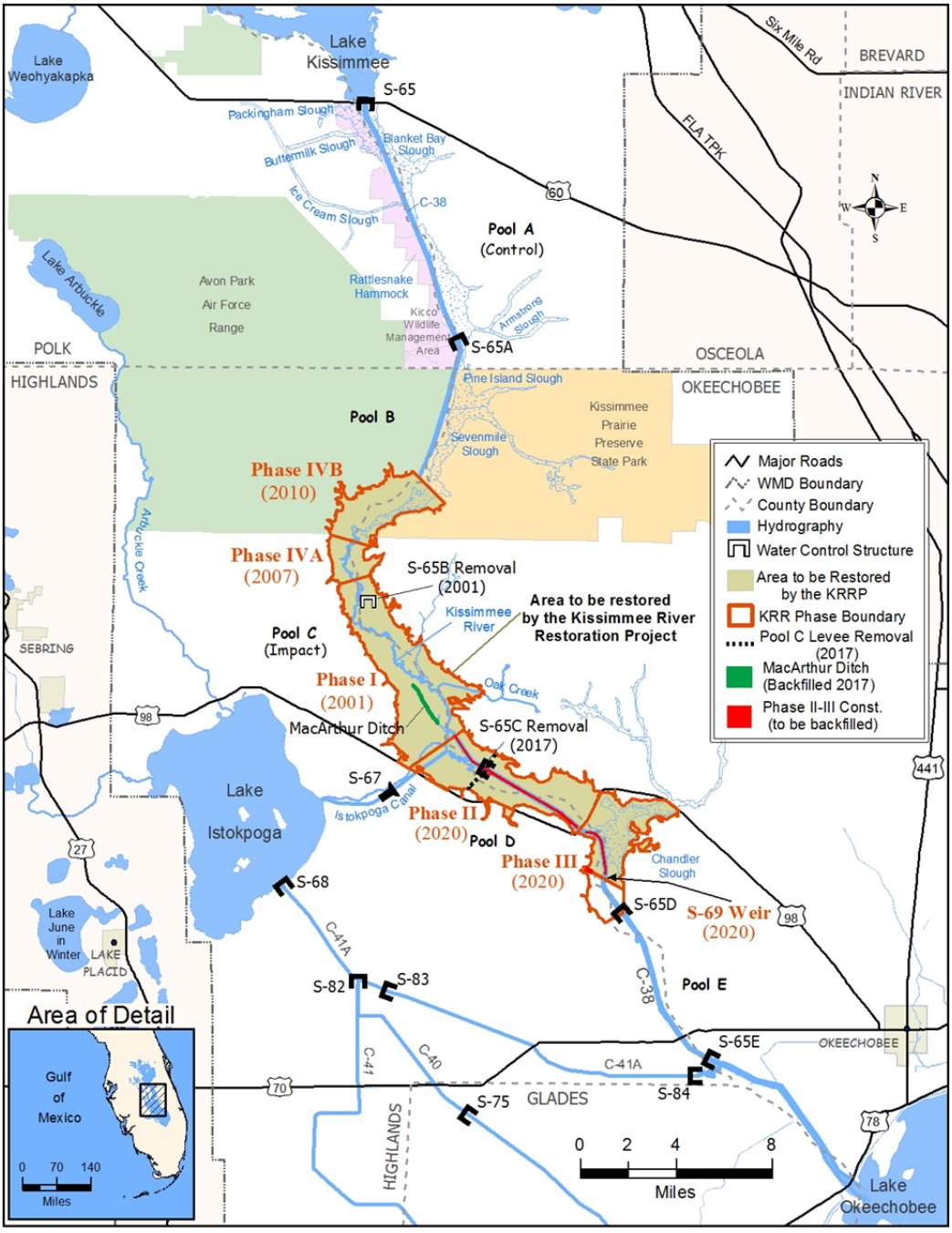

Figure 7-1. Kissimmee River Restoration Project area.

COMPREHENSIVE EVERGLADES RESTORATION PLAN

CERP provides a guide to restore, protect, and preserve 18,000 square miles of the Everglades. The United States Congress approved the restoration plan in the Water Resources Development Act of 2000. Information about CERP implementation can be found on the CERP website (https://www.evergladesrestoration.gov) and in annual updates of the SFER (www.sfwmd.gov; Search: SFER). CERP projects in the LKB Planning Area include the following:

- ASR Regional Study and Pilot Projects
- Lake Okeechobee Watershed Restoration Project

Aquifer Storage and Recovery

As part of CERP, the United States Army Corps of Engineers (USACE) and SFWMD (2015) jointly developed the ASR Regional Study as a technical guide for considering ASR as part of Everglades restoration efforts, including the Lake Okeechobee Watershed Restoration Project (discussed in the following section). The study incorporated results from two pilot ASR systems, numerous exploratory tests, and multiple regional investigations (a groundwater flow model, baseline ecological studies, and geochemical analyses) to address technical uncertainties and assess risks. The study concluded that large-capacity (5 million gallons per day) ASR systems are feasible in South Florida where suitable aquifer characteristics exist. Additionally, ASR can be implemented as part of CERP projects as a means of optimizing environmental restoration features. An incremental adaptive restoration approach for future ASR systems as part of CERP should involve one or more clusters of ASR wells to address uncertainties such as recovery efficiency, performance, long-term water quality, and ecological effects.

Kissimmee ASR Test Well

The USGS, under contract with the SFWMD, is studying the potential for nutrient reduction via ASR systems after a substantial reduction in phosphorus concentration was observed in water recovered from the CERP Kissimmee ASR facility. The USGS is evaluating the microbial community in the FAS and the rates of nutrient reduction that might be anticipated as ASR is implemented.

Lake Okeechobee Watershed Restoration Project

In 2016, the USACE and SFWMD reinitiated planning efforts for the Lake Okeechobee Watershed Restoration Project (LOWRP), which aims to:

- Improve quantity, timing, and distribution of flows into Lake Okeechobee to maintain ecologically desired lake stage ranges more often;
- Reduce large freshwater releases from Lake Okeechobee to improve the salinity regime and the quality of habitats for oyster, submerged aquatic vegetation, and other estuarine communities in the northern estuaries;
- Increase the spatial extent and functionality of aquatic and wildlife habitat within Lake Okeechobee and the surrounding watershed; and
- Increase availability of water supply to existing legal users of Lake Okeechobee commensurate with improving Lake Okeechobee ecology.

LOWRP covers a large portion of the Lake Okeechobee watershed north of the lake and within the LKB Planning Area (**Figure 7-2**). Project features in the Tentatively Selected Plan that are under consideration to meet the project goals include a 46,000-acre-foot wetland attenuation feature, 80 ASR wells, and approximately 4,800 acres of wetland restoration (**Figure 7-3**). During the 2019 session, the Governor and Florida Legislature approved a $50 million appropriation for the SFWMD to design, engineer, and construct project components designed to reduce harmful discharges to the estuaries. In coordination with the USACE, the SFWMD is using this funding to accelerate the ASR component of LOWRP and will begin the evaluation and design of ASR systems north of Lake Okeechobee. A revised Draft Project Implementation Report/Environmental Impact Statement was made available for public comment in July 2019, and as of November 2019, a draft final version is being prepared for project approval by the SFWMD and USACE.

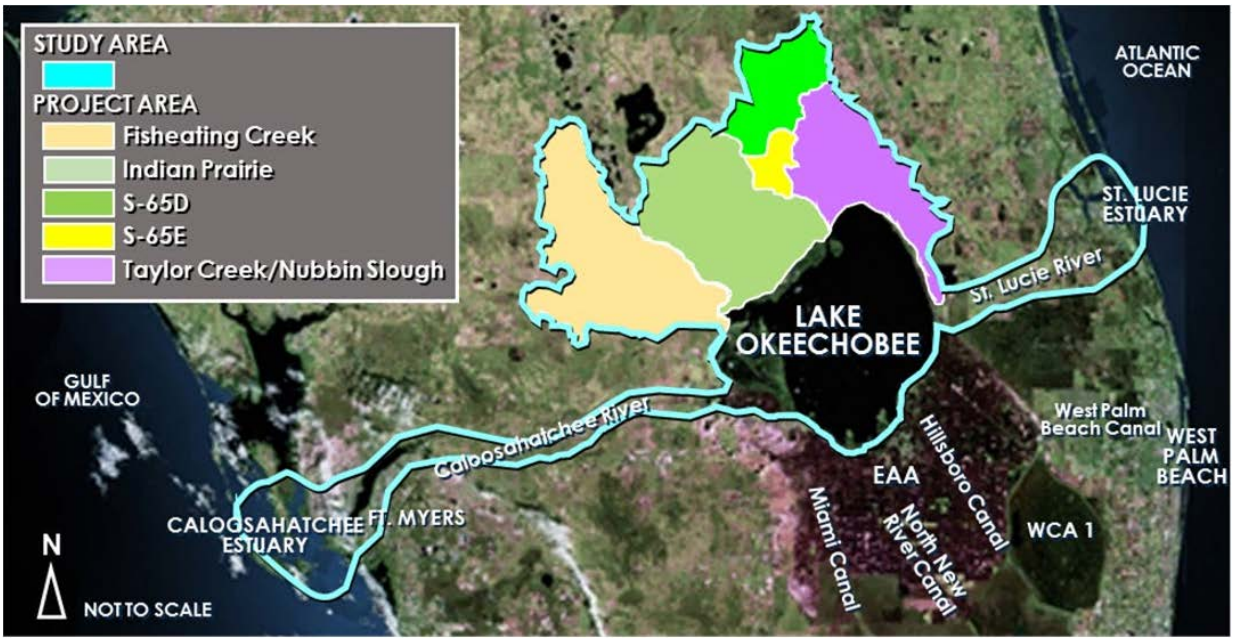

Figure 7-2. Lake Okeechobee Watershed Restoration Project area.

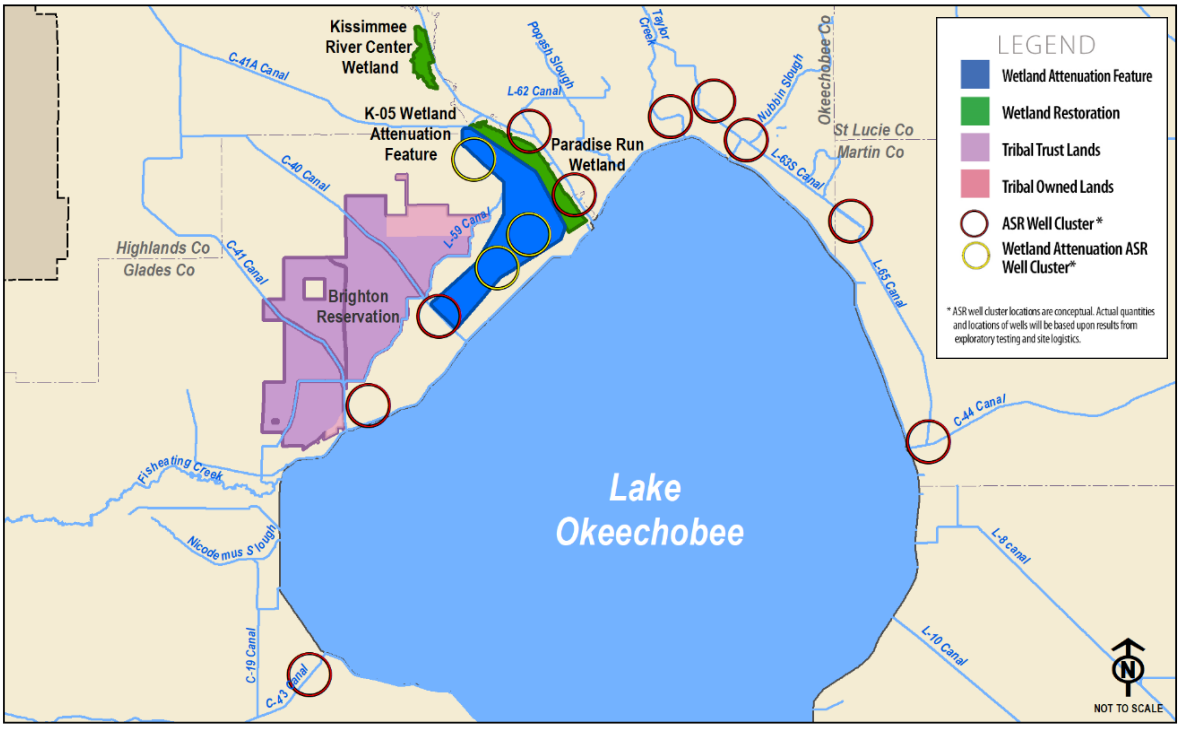

Figure 7-3. Lake Okeechobee Watershed Restoration Project Tentatively Selected Plan components.

DISPERSED WATER MANAGEMENT PROGRAM

The SFWMD participates in the multi-agency Dispersed Water Management Program, which works cooperatively with public and private landowners to retain or treat stormwater on the landscape rather than discharging it when discharges to downstream water bodies may be harmful. The Dispersed Water Management Program includes three project types: passive storage, active storage, and active treatment. Passive storage projects provide shallow water storage by capturing rainfall on a property and distributing it across the site. These projects use relatively simple structures or operational changes and require minimal site alterations to achieve storage benefits. Active storage projects require more infrastructure and site improvements to pump stormwater from the regional system and store it in aboveground impoundments. Active treatment projects also require greater infrastructure and site improvements to pump excess water from the regional system and attenuate it across the landscape, providing treatment/nutrient reductions prior to returning the water to the regional system. To date, through a combination of public and private projects, the program has more than 123,100 acre-feet of storage in operation and an additional 223,800 acre-feet in construction, design, permitting, or planned throughout the Everglades system, including the Caloosahatchee River Estuary and St. Lucie Estuary watersheds, and sites north of Lake Okeechobee.

Dispersed Water Management

The focus of the Dispersed Water Management Program is to retain and treat excess runoff during wet conditions for the benefit of local waterways, wetlands, and coastal estuaries. Locally, dispersed water management projects may expand groundwater recharge opportunities because of on-site retention and higher water tables. However, because this is shallow storage, the volume of water is insufficient to be considered a water source during the dry season. There are multiple dispersed water management projects in the LKB Planning Area (**Figure 7-4**).

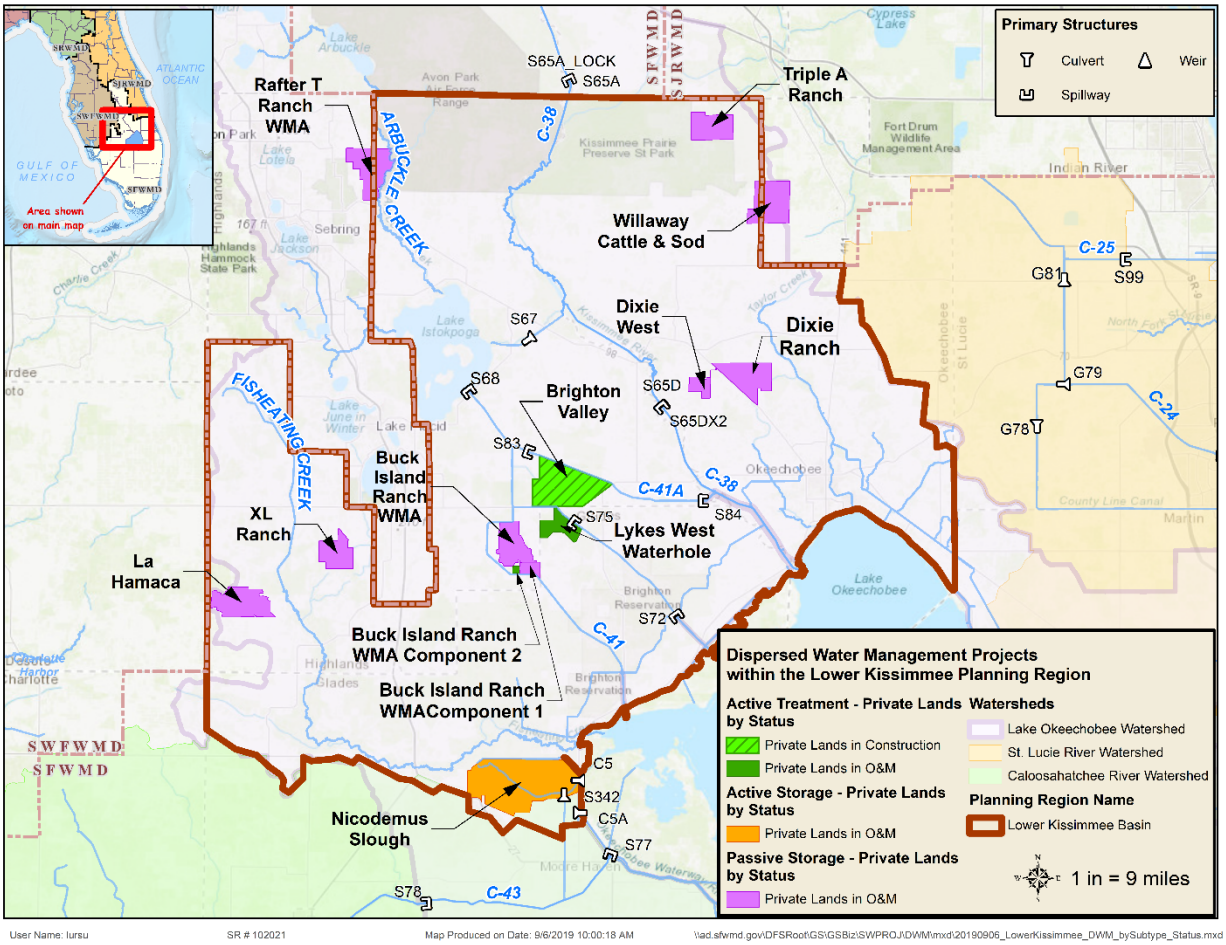

Figure 7-4. Dispersed water management projects within the LKB Planning Area.

NORTHERN EVERGLADES AND ESTUARIES PROTECTION PROGRAM

In 2007, the Governor and Florida Legislature authorized the Northern Everglades and Estuaries Protection Program (NEEPP) [Section 373.4595, F.S.], which expanded the existing Lake Okeechobee Protection Act. Legislation required the completion of watershed protection plans for the Lake Okeechobee, Caloosahatchee River, and St. Lucie River watersheds as part of NEEPP. The watershed protection plans build on existing approaches and consolidate restoration efforts throughout the Northern Everglades system. More details about specific projects and activities under the watershed protection plans are included in annual updates of the SFER (www.sfwmd.gov; Search: SFER). Further information about NEEPP can be found on the SFWMD website (www.sfwmd.gov; Search: Northern Everglades and Estuaries).

Lake Okeechobee Watershed Protection Plan

The SFWMD, Florida Department of Environmental Protection, and Florida Department of Agriculture and Consumer Services initially developed the Lake Okeechobee Watershed Protection Plan (LOWPP) in 2004 (SFWMD et al. 2004), and it was updated in 2007, 2008, 2011, and 2015 (SFWMD et al. 2007, 2008, 2011; Sharfstein et al. 2015). The protection plan includes source controls (e.g., best management practices) and several subregional and regional technologies, such as stormwater treatment areas (STAs) and alternative treatment technologies, to improve the quality of water within the watershed and delivered to Lake Okeechobee. Several measures are included in the protection plan to improve water levels within the lake as well as the quality, quantity, and timing of discharges from Lake Okeechobee to the northern estuaries. These measures include reservoirs, Dispersed Water Management Program projects, and ASR systems. The NEEPP statute was updated by the Florida Legislature in 2016 to require LOWPP (administered by the SFWMD) be updated every 5 years, beginning in 2020, to ensure the protection plan is consistent with the adopted Lake Okeechobee Basin Management Action Plan (administered by the Florida Department of Environmental Protection). The SFWMD currently is updating LOWPP to identify modifications to and recommendations for projects within the Lake Okeechobee Watershed Construction Project (LOWCP), a component of LOWPP. The LOWPP update is anticipated to be submitted to the Florida Legislature in March 2020. Further information about specific activities included in the LOWCP can be found on the SFWMD website (www.sfwmd.gov; Search: LOWCP).

Taylor Creek and Nubbin Slough Stormwater Treatment Areas

Taylor Creek and Nubbin Slough are interconnected basins that drain into Lake Okeechobee from the north and northeast. The region was identified as contributing large amounts of phosphorus to Lake Okeechobee and several STA and reservoir projects are ongoing in the basin. Two pilot-scale STAs were constructed and are operating in the Taylor Creek and Nubbin Slough basins. These STAs are a major component of the LOWCP, now a component of NEEPP. Both projects were designed to reduce phosphorus concentrations entering Lake Okeechobee.

WATER SUPPLY DEVELOPMENT PROJECTS

Water users, such as Public Water Supply utilities; local and tribal governments; and self-suppliers, including Industrial/Commercial/Institutional and Agricultural Irrigation users, are primarily responsible for water supply development projects. SFWMD water supply plans typically list proposed sources and water supply development projects to meet future demands. However, while surface water supplies are limited in the LKB Planning Area, groundwater is believed to be adequate to meet projected demands through 2040. Therefore, additional water supply development projects do not appear to be needed at this time and users, including Public Water Supply utilities, have not proposed any projects.

Should a user determine a water supply development project is needed in the future, each proposed use of water must meet the conditions for permit issuance found in Section 373.223, F.S., and the implementing criteria found in Chapter 40E-2, Florida Administrative Code. SFWMD water supply planning staff will coordinate with permitting staff regarding initial screening of any proposed water supply development project before including it in future water supply plan updates to ensure the project has a likelihood of being permittable.

SUMMARY OF WATER RESOURCE AND SUPPLY DEVELOPMENT PROJECTS

Water resource development projects serve various purposes in support of water supply development. Benefits of the water resource development projects reviewed in this chapter include the following:

- Improved understanding of the hydrogeology and water availability of the region
- Preservation of existing supplies through better understanding, management, and continued monitoring of resources
- Development of the ECFTX groundwater model for evaluation of regional groundwater conditions
- Coordination with other agencies and stakeholders to exchange hydrogeologic knowledge and data
- Comprehensive planning and construction of environmental restoration projects associated with the Everglades
- Partnering with local landowners to create dispersed water storage features
- Implementation of subregional watershed planning initiatives

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8

Future Direction

This chapter of the *2019 Lower Kissimmee Basin Water Supply Plan Update* (2019 LKB Plan Update) summarizes the future direction of water supply planning in the LKB Planning Area of the South Florida Water Management District (SFWMD or District). This plan update assesses the water supply demand and available sources for the LKB Planning Area through 2040. Water demand is expected to increase by approximately 12 million gallons per day (mgd) in the LKB Planning Area by 2040, primarily due to increases in Agricultural Irrigation (AGR), as discussed in **Chapter 2**. Water conservation is an important component of integrated water resource management and may reduce, defer, or eliminate the need to expand water supply infrastructure. Water conservation by all users is a key element in meeting future water needs (**Chapter 3**).

TOPICS

- Demand Summary
- Demand Management: Water Conservation
- Natural Systems and Resource Protection
- Water Source Options
- Coordination
- Climate Change
- Conclusions

Activities related to natural systems can affect future water supplies within the LKB Planning Area, including Comprehensive Everglades Restoration Plan (CERP) projects and changes to lake regulation schedules. In addition, regulatory criteria designed to protect water resources, including elements identified in Minimum Flow and Minimum Water Level (MFL) recovery and prevention strategies, place limitations on water allocations (**Chapter 4** and **Appendix C**).

Guidance in this 2019 LKB Plan Update should be considered when developing water supply options to meet future needs. Statutory requirements, existing conditions, resource constraints (including protection tools and criteria), and the needs of all water users are addressed. All water users are encouraged to be prudent with water use decisions and to use water efficiently. The SFWMD's future direction for water supply planning in the LKB Planning Area recommends continued coordination with agricultural stakeholders, utilities, and other water users; protection of natural resources; diversification of water supply sources; and monitoring to develop responses to changes in water levels and quality in surface water and groundwater.

DEMAND SUMMARY

Total average annual demands for all water use categories in 2040 are projected to be 257 mgd (**Table 8-1**). This is a 5 percent increase from the estimated 2017 demands (245 mgd).

Table 8-1. Summary of current and projected gross water demands under average rainfall conditions in the LKB Planning Area, by water use category.

Water Use Category	2017 Estimated Use	2040 Projected Demand	Percent Change	Percent of Projected 2040 Total Demand
AGR	237.02	248.14	4.7%	96.4%
PWS	3.04	3.39	11.5%	1.3%
DSS	2.02	2.28	12.9%	0.8%
ICI	1.70	1.95	14.7%	0.8%
REC	1.64	1.73	5.5%	0.7%
PWR	0.00	0.00	0.0%	0.0%
Total	**245.42**	**257.49**	**4.9%**	**100.0%**

AGR = Agricultural Irrigation; DSS = Domestic and Small Public Supply; ICI = Industrial/Commercial/Institutional; LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWR = Power Generation; PWS = Public Water Supply; REC = Recreational/Landscape Irrigation.

DEMAND MANAGEMENT: WATER CONSERVATION

Water conservation programs by all water use categories offer the potential to reduce the water needed to meet future demands (**Chapter 3**). All water users are urged to implement water conservation measures to reduce water supply demands and defer the construction of capital-intensive projects. The following conservation-related actions are recommended:

- The SFWMD will continue to implement the 2008 Comprehensive Water Conservation Program.
- Agricultural water users are encouraged to install higher-efficiency irrigation systems, where appropriate, for specific crop types.
- When applicable, agricultural water users are encouraged to use Florida Automated Weather Network irrigation tools.
- Water users are encouraged to implement best management practices to increase water conservation and water use efficiency, which are economical measures to help meet future demands.
- Local governments should evaluate the implementation of existing and additional water conservation measures appropriate for their jurisdiction, such as two-days-per-week landscape irrigation ordinances and requirements for water-efficient construction of new homes and commercial properties.
- Local governments should consider developing or enhancing existing ordinances to be consistent with Florida-Friendly Landscaping™ provisions [Section 373.185, Florida Statutes].

- Public education programs can help instill a year-round conservation ethic. Local and tribal governments and utilities are encouraged to provide water conservation-related educational programs in cooperation with the SFWMD.
- Water users are encouraged to seek cost-share funding opportunities that may be available to them for water conservation projects.
- Landscape water users are encouraged to implement advanced irrigation technology, improve landscape design and management practices, and participate in recognition programs to further increase landscape water use efficiency.
- Industrial, commercial, and institutional entities are encouraged to utilize the *Water Efficiency Self-Assessment Guide for Commercial and Institutional Managers* (SFWMD 2011) to improve water use efficiency and reduce operating costs.

NATURAL SYSTEMS AND RESOURCE PROTECTION

A wide range of activities related to natural systems can affect future water supplies within the LKB Planning Area, including CERP projects and changes to regulation schedules for Lake Okeechobee and other water bodies. In addition, regulatory criteria designed to protect water resources, including elements identified in MFL recovery and prevention strategies, can place limitations on water allocations (**Chapter 4** and **Appendix C**).

Restored Kissimmee River

Water supply needs for natural systems are addressed by water resource development projects such as CERP (**Chapter 7**). CERP includes regional projects to improve the quality, timing, volume, distribution, and delivery of water to the natural system and other water-related needs. Ongoing environmental restoration and water resource protection efforts include the following:

- Continue to make progress towards completion of the Kissimmee River Restoration Project.
- Continue to partner with the United States Army Corps of Engineers on planning for future CERP projects in the Lake Okeechobee watershed and construction of approved projects.
- Continue partnerships with private landowners for dispersed water management, water quality, and water storage reservoir projects, where appropriate.
- Continue to monitor natural areas, including Lake Istokpoga, Taylor Creek/Nubbin Slough, the Kissimmee River, and Lake Okeechobee, and provide annual updates in the South Florida Environmental Report to track the health of the ecosystems and meet regulatory requirements.
- Continue to implement, review, and update MFL recovery and prevention strategies, as appropriate, in conjunction with future water supply plan updates.
- Complete the Kissimmee River and Chain of Lakes Water Reservations to reserve water for the protection of fish and wildlife from increased consumptive uses.

WATER SOURCE OPTIONS


Lake Okeechobee

The LKB Planning Area relies on surface water and fresh groundwater for urban, agricultural, and industrial uses. Most PWS demand is met by the Okeechobee Utility Authority with surface water from Lake Okeechobee. The other four PWS utilities in the LKB Planning Area rely on fresh groundwater from the surficial and Floridan aquifer systems (SAS and FAS). AGR relies on a combination of surface water and fresh groundwater (**Chapter 5**).

Withdrawals from the SAS primarily are for Domestic and Small Public Supply (DSS) and small-scale agricultural uses. The Seminole Tribe of Florida's Brighton Reservation currently relies on the SAS for AGR and Public Water Supply (PWS) but is in the process of converting to the FAS for PWS use. The FAS produces good-quality water and is the most used water source in the LKB Planning Area. Use of the FAS likely will continue increasing to meet future water demands in the region as it is a practical solution to meet some of the region's AGR needs when surface water availability is limited.

Reclaimed water can be used to meet new uses or replace freshwater sources and potable water currently used for irrigation or industrial purposes. Additionally, water storage features such as reservoirs, aquifer storage and recovery (ASR) wells, and impoundments can capture excess stormwater, groundwater, and surface water during wet weather periods and provide supplemental water supply for AGR, PWS, natural systems, and other needs.

The SFWMD offers guidance in the following sections for consideration by local and tribal governments, utilities, agricultural entities, other water users, and SFWMD water supply managers and staff as a basis for the future direction of water supply planning in the LKB Planning Area.

Surface Water

Surface water is the primary source of water for potable use by the Okeechobee Utility Authority, which represents approximately two-thirds of current PWS demand. Surface water supply sources in/adjacent to the LKB Planning Area include Lake Istokpoga, the Kissimmee River, and Lake Okeechobee and its connected secondary canal system located in Lake Okeechobee Service Area (LOSA). Water availability from these systems is limited due to Restricted Allocation Area criteria and proposed Water Reservations. Additional water storage features could enhance water availability. The following actions are suggested:

- Complete and implement the components identified in the Lake Okeechobee Watershed Restoration Project (LOWRP) Tentatively Selected Plan. Part of CERP, LOWRP will increase the watershed's storage capacity and improve the quantity and timing of water deliveries to Lake Okeechobee.
- Local and tribal governments, utilities, and agricultural operations are encouraged to create additional storage capacity for surface water, when feasible.

- Complete development of the Kissimmee River and Chain of Lakes Water Reservations.
- The SFWMD will continue to implement MFL recovery and prevention strategies for Lake Istokpoga and Lake Okeechobee and update these, if needed, in conjunction with future plan updates.
- Complete rehabilitation of the Herbert Hoover Dike and development of the Lake Okeechobee System Operation Manual by the United States Army Corps of Engineers by 2022.
- AGR users are encouraged to reduce or augment use of surface water, when technically and economically feasible, with projects such as stormwater and tailwater recovery, the blending of brackish groundwater with fresh water where available, and more efficient water conservation practices.

Groundwater

Groundwater, particularly from the FAS, is the primary source of water for agricultural use. Many agricultural stakeholders also use groundwater from the SAS and intermediate aquifer system as supplemental sources. Although most PWS demand currently is met with surface water, utilities are likely to rely more on groundwater in the future.

Surficial Aquifer System

At current use rates and locations, water levels in the SAS appear to be stable. Increased use of the SAS is projected to be minor. The potential use of the SAS for new or increased allocations will be evaluated on an application-by-application basis to determine if the project meets water use permitting criteria. The following actions are suggested:

- All local water users are encouraged to coordinate with the SFWMD to determine if the SAS is an appropriate source for their intended use.
- Design of wells and wellfield locations, configurations, and pumping regimes should maximize withdrawals while avoiding harm to natural systems and other users.

Floridan Aquifer System

The FAS typically is productive in the LKB Planning Area and expected to be the primary source, in combination with surface water, to meet 2040 demands. While generally fresh, the upper portions of the FAS become brackish near Lake Okeechobee. In addition, points of withdrawal in the FAS near the boundary between the SFWMD and Southwest Florida Water Management District increase the potential to impact MFL water bodies along Lake Wales Ridge. The following actions are suggested:

- Brackish water from the FAS may be blended with fresh groundwater and/or surface water to produce acceptable irrigation-quality water. Blended water supplies depend on crop requirements, water sources, volume of stored water, and natural system requirements. They also require monitoring to ensure acceptable water quality.

- Local water users and utilities developing FAS wellfields are encouraged to collaborate with the SFWMD. Water quality, water level, and hydrologic data from such wells can be used in SFWMD regional groundwater flow models and can increase knowledge and understanding of the FAS.
- Landowners are encouraged to plug and abandon inactive or dysfunctional FAS wells in accordance with existing rules and regulations.

Reclaimed Water

Reclaimed water can be used to meet new uses or replace traditional freshwater sources currently used for irrigation or industrial purposes, but its availability in the LKB Planning Area is very limited. The following actions are suggested:

- Utilities are encouraged to expand the efficient use of reclaimed water and minimize disposal practices.
- Local government and utilities should support septic to sewer conversions for water quality benefits, which could increase wastewater flow and the potential for water reuse.

New Storage Capacity for Surface Water or Groundwater

Water storage features such as reservoirs, ASR systems, and impoundments can be used to capture stormwater, groundwater, and surface water during wet weather periods and provide supplemental water supply for AGR, PWS, natural systems, and other needs. The following actions are suggested:

Kissimmee River ASR Facility

- All users should consider developing new storage and stormwater capture options. In the LKB Planning Area, potential types of water storage include ASR wells, reservoirs, and surface water impoundments and ponds. Proposed projects that develop new storage and create additional water supply may be considered alternative water sources.
- Construction of new or retrofitted surface water storage systems, coupled with lower-quality groundwater, for agricultural operations will provide additional supply for irrigation.
- If the LKB Planning Area experiences changes in crop types and irrigated acreage, agricultural operations may need to construct additional surface water storage systems to increase water availability.

COORDINATION

Coordination and collaboration among regional, local, tribal, and utility planning entities throughout the water supply planning process are essential. Examples of coordination activities include the following:

- Water Supply Facilities Work Plans are due within 18 months of approval of this 2019 LKB Plan Update. Local governments and utilities need to provide linkages and coordination between the plan update and the local government water supply-related elements of their Comprehensive Plans.
- The SFWMD should continue implementing CERP projects (e.g., Lake Okeechobee Watershed Restoration Project) within the region.
- The SFWMD should continue to work with the Florida Department of Agriculture and Consumer Services and agricultural stakeholders on development of the Florida Statewide Agricultural Irrigation Demand geodatabase for future crop projections.
- The SFWMD should coordinate ongoing activities outside the basin with the Southwest Florida Water Management District, St. Johns River Water Management District, and Central Florida Water Initiative (including the Upper Kissimmee Basin of the SFWMD) planning efforts.
- The SFWMD should continue collaboration with the Florida Department of Environmental Protection and Department Agriculture and Consumer Services through the Lake Okeechobee Basin Management Action Plan, including stormwater, water quality, and water storage in the LKB Planning Area.
- The SFWMD will coordinate with stakeholders on the development and use of regional groundwater models to evaluate regional water resource availability.

CLIMATE CHANGE

Potential changes in air temperature and rainfall patterns could affect hydrologic conditions, and thus water supply sources, as well as patterns of water demand. Recommendations related to climate change include the following:

- Because of potential changes in climatic patterns, the SFWMD should continue to investigate the scientific literature regarding future scenarios of climate patterns for use in the next 5-year cycle of water supply plan updates.
- The SFWMD should continue to partner with other agencies, local and tribal governments, utilities, academic institutions, and other stakeholders to identify methods to evaluate the potential impacts of climate change in the planning area.

CONCLUSIONS

This 2019 LKB Plan Update assesses the water supply demand and available sources for the LKB Planning Area through 2040. Sufficient water appears to be available to meet the 2040 projected water demand during 1-in-10 year drought conditions for most users. Currently, this level of certainty is reduced to 1-in-6 year drought conditions for water users (primarily agricultural) that rely solely on surface water from Lake Okeechobee or its tributaries within the LOSA portion of the planning area. The potential for additional water from Lake Okeechobee resulting from operational changes or a revised regulation schedule is discussed in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018).

This plan update concludes that future water needs of the region can be met through the 2040 planning horizon with appropriate management and conservation. Successful implementation of this 2019 LKB Plan Update requires close coordination and collaboration with agricultural interests, local and tribal governments, utility water supply planning entities, and other stakeholders. This partnering should ensure that water resources in the LKB Planning Area continue to be prudently managed and available to meet future demand while also protecting the environment.

REFERENCES

SFWMD. 2011. *Water Efficiency Self-Assessment Guide for Commercial and Institutional Managers*. South Florida Water Management District, West Palm Beach, FL.

SFWMD. 2018. *2018 Lower East Coast Water Supply Plan Update.* South Florida Water Management District, West Palm Beach, FL.

Glossary

1-in-10 year drought A year in which below normal rainfall occurs with a 90 percent probability of being exceeded in any other year. It has an expected return frequency of once in 10 years.

1-in-10 year level of certainty (see *Level of Certainty*)

Acre-foot, acre-feet The volume of water that covers 1 acre (43,560 square feet) to a depth of 1 foot. The equivalent of 43,560 cubic feet, 1,233.5 cubic meters, or 325,872 gallons.

Agricultural best management practice (Agricultural BMP) A practice or combination of agricultural practices, based on research, field testing, and expert review, determined to be the most effective and practicable means of improving water quality or quantity while maintaining or even enhancing agricultural production.

Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) A water budget model for calculating irrigation demands that estimates demand based on basin-specific data. The AFSIRS model calculates both net and gross irrigation requirements for average and 1-in-10 year drought irrigation requirements. A crop's net irrigation requirement is the amount of water delivered to the root zone of the crop, while the gross irrigation requirement includes both the net irrigation requirement and the losses incurred in the process of delivering irrigation to the crop's root zone.

Agricultural Irrigation (AGR) Self-supplied water used for commercial crop irrigation, greenhouses, nurseries, livestock watering, pasture, and aquaculture.

Alternative water supply Salt water; brackish surface water and groundwater; surface water captured predominately during wet-weather flows; sources made available through the addition of new storage capacity for surface water or groundwater; water that has been reclaimed after one or more public supply, municipal, industrial, commercial, or agricultural uses; the downstream augmentation of water bodies with reclaimed water; stormwater; and, any other water supply source that is designated as nontraditional for a water supply planning region in the applicable regional water supply plan [Section 373.019, Florida Statutes (F.S.)].

***Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (Applicant's Handbook)** Read in conjunction with Chapter 40E-2, Florida Administrative Code (F.A.C.), the Applicant's Handbook further specifies the general procedures and criteria used by SFWMD staff for review of water use permit applications to ensure water uses permitted by the SFWMD are reasonable-beneficial, do not interfere with existing legal users, and are in the public interest.

Aquifer A geologic formation, group of formations, or part of a formation that contains sufficient saturated, permeable material to yield significant quantities of water to wells and springs.

Aquifer storage and recovery (ASR) The underground storage of potable water, stormwater, surface water, fresh groundwater, or reclaimed water, which is appropriately treated to potable standards and injected into an aquifer through wells. The aquifer (typically the Floridan aquifer system in South Florida) acts as an underground reservoir for the injected water, reducing water loss to evaporation. The water is injected during the wet season or when water is readily available and stored with the intent to recover it for use during future dry periods.

Aquifer system A heterogeneous body of (interbedded or intercalated) permeable and less permeable material that functions regionally as a water-yielding hydraulic unit and may be composed of more than one aquifer separated at least locally by confining units that impede groundwater movement, but do not greatly affect the hydraulic continuity of the system.

Average rainfall year A year having rainfall with a 50 percent probability of being exceeded over a 12-month period.

Base condition A specified period of time during which collected data are used for comparison with subsequent data.

Basin There are two types of basins: 1) a groundwater basin is a hydrologic unit consisting of one large aquifer, or several connecting and interconnecting aquifers; and 2) a surface water basin is a tract of land drained by a surface water body or its tributaries.

Boulder Zone A highly transmissive, cavernous zone of dolomite within the Lower Floridan aquifer used to dispose of secondary-treated effluent from wastewater treatment facilities and concentrate from membrane water treatment plants via deep injection wells.

Brackish water Water with a chloride concentration greater than 250 milligrams per liter (mg/L) and less than 19,000 mg/L.

Canal A manmade waterway used for draining or irrigating land or for navigation by boat.

Capacity Capacity represents the ability to treat, move, or reuse water. Typically, capacity is expressed in millions of gallons per day (mgd).

Central and Southern Florida Flood Control Project (C&SF Project) A complete system of canals, storage areas, and water control structures spanning the area from Lake Okeechobee to the east and west coasts and from Orlando south to the Everglades. It was designed and constructed during the 1950s by the United States Army Corps of Engineers (USACE) to provide flood control and improve navigation and recreation.

Comprehensive Everglades Restoration Plan (CERP) The federal-state partnership framework and guide for the restoration, protection, and preservation of the South Florida ecosystem. CERP also provides for water-related needs of the region, such as water supply and flood protection.

Confined aquifer An aquifer containing groundwater that is confined under pressure and bounded between substantially less permeable materials such that water will rise in a fully penetrating well above the top of the aquifer. In cases where the hydraulic head is greater than the elevation of the overlying land surface, a fully penetrating well will naturally flow at the land surface without means of pumping or lifting.

Confining unit A body of significantly less permeable material than the aquifer, or aquifers, that it stratigraphically separates. The hydraulic conductivity may range from nearly zero to some value significantly lower than that of the adjoining aquifers, and impedes the vertical movement of water.

Conservation (see *Water conservation*)

Consumptive use Any use of water that reduces the supply from which it is withdrawn or diverted**.**

Control structure An artificial structure designed to regulate the level/flow of water in a canal or other water body (e.g., weirs, dams).

DBHYDRO The SFWMD's corporate environmental database, storing hydrologic, meteorologic, hydrogeologic, and water quality data.

Demand The quantity of water needed to fulfill a requirement.

Demand management Reducing the demand for water through activities that alter water use practices, improve efficiency in water use, reduce losses of water, reduce waste of water, alter land management practices, and/or alter land uses.

Dike An embankment to confine or control water, especially one built along the banks of a river or lake to prevent overflow of lowlands; a levee.

Discharge The rate of water movement past a reference point, measured as volume per unit of time (usually expressed as gallons per minute, cubic feet per second, or cubic meters per second).

Disinfection The process of inactivating microorganisms that cause disease. All potable water requires disinfection as part of the treatment process prior to distribution. Disinfection methods include chlorination, ultraviolet radiation, and ozonation.

Disposal Effluent disposal involves the practice of releasing treated effluent back to the environment using ocean outfalls, surface water discharges, or deep injection wells.

Domestic and Small Public Supply (DSS) Potable water used by households served by small utilities (less than 0.10 mgd) or self-supplied by private wells.

Domestic wastewater Wastewater derived principally from residential dwellings, commercial buildings, and institutions; sanitary wastewater; sewage.

Drainage basin The land area where precipitation ultimately drains to a particular watercourse (e.g., river, stream) or body of water (e.g., lake, reservoir). Drainage basins in South Florida are defined by rule and periodically are redefined to reflect changes in the regional drainage network.

Drawdown 1) The vertical distance between the static water level and the surface of the cone of depression. 2) A lowering of the groundwater surface caused by pumping.

Drought A long period of abnormally low rainfall, especially one that reduces water supply availability.

Ecology The study of the inter-relationships of plants and animals to one another and to their physical and biological environment.

Ecosystem Biological communities together with their environment, functioning as a unit.

Ecosystem restoration The process of reestablishing to as near its natural condition as possible, the structure, function, and composition of an ecosystem.

Elevation The height in feet above mean sea level according to National Geodetic Vertical Datum of 1929 (NGVD29) or North American Vertical Datum of 1988 (NAVD88). May also be expressed in feet above mean sea level as reference datum.

Environmental impact statement An evaluation of the positive and negative environmental effects of a proposed agency action required under United States environmental law by the National Environmental Policy Act for federal government agency actions "significantly affecting the quality of the human environment."

Estuary A body of water found where a river meets the ocean that is characterized by fresh water mixing with salt water.

Evapotranspiration The total loss of water to the atmosphere by evaporation from land and water surfaces and by transpiration from plants.

Exceedance (MFL) As defined in Rule 40E-8.021(17), F.A.C., to fall below a minimum flow or level, which is established in Parts II and III of Chapter 40E-8, F.A.C, for a duration greater than specified for the MFL water body.

Finished water Water that has undergone a purification or treatment process; water that has passed through all the processes in a water treatment plant and is ready to be delivered to consumers. Contrast with *Raw water*.

Finished water demand (see *Net water demand*)

Fiscal Year (FY) The South Florida Water Management District's fiscal year begins on October 1 and ends on September 30 the following year.

Florida Administrative Code (F.A.C.) The Florida Administrative Code is the official compilation of the administrative rules and regulations of state agencies.

Florida Department of Agriculture and Consumer Services (FDACS) An executive department of the Government of Florida. FDACS supports and promotes Florida agriculture, protects the environment, safeguards consumers, and ensures the safety and wholesomeness of food. The Office of Agricultural Water Policy works with agricultural producers, industry groups, the Florida Department of Environmental Protection, universities, and water management districts to develop and implement agricultural best management practices, addressing water quality and water conservation.

Florida-Friendly landscaping Quality landscapes that conserve water, protect the environment, are adaptable to local conditions, and are drought tolerant. The principles of such landscaping include planting the right plant in the right place, efficient watering, appropriate fertilization, mulching, attraction of wildlife, responsible management of yard pests, recycling yard waste, reduction of stormwater runoff, and waterfront protection. Additional components include practices such as landscape planning and design, soil analysis, the appropriate use of solid waste compost, minimizing the use of irrigation, and proper maintenance.

Florida Statutes (F.S.) The Florida Statutes are a permanent collection of state laws organized by subject area into a code made up of titles, chapters, parts, and sections. The Florida Statutes are updated annually by laws that create, amend, or repeal statutory material.

Floridan aquifer system (FAS) A highly used, deep aquifer system composed of the Upper and Lower Floridan aquifers. It is the principal source of water supply north of Lake Okeechobee and is highly mineralized south of the lake, requiring membrane treatment prior to use.

Flow The actual amount of water flowing by a particular point over some specified time. In the context of water supply, flow represents the amount of water being treated, moved, or reused. Flow is frequently expressed in millions of gallons per day (mgd).

Fresh water An aqueous solution with a chloride concentration less than or equal to 250 mg/L.

Gross (raw) water demand The amount of water withdrawn from a water resource to meet a particular need of a water user or customer. Gross demand is the amount of water allocated in a water use permit. Gross or raw water demands are nearly always higher than net or user/customer water demands to account for treatment and distribution losses.

Groundwater Water beneath the surface of the ground, whether or not flowing through known and definite channels. Specifically, that part of the subsurface water in the saturated zone, where the water is under pressure greater than the atmosphere.

Groundwater recharge (see *Recharge*)

Harm As defined in Chapter 40E-8, F.A.C., the temporary loss of water resource functions that results from a change in surface or groundwater hydrology and takes a period of one to two years of average rainfall conditions to recover.

Headwater(s) 1) Water that is typically of higher elevation (with respect to tailwater) or on the controlled side of a structure. 2) The waters at the highest upstream point of a natural system that are considered the major source waters of the system.

Hydrogeologic unit Any rock unit or zone that because of its hydraulic properties has a distinct influence on the storage or movement of groundwater.

Hydrogeology The geology of groundwater, with emphasis on the chemistry and movement of water.

Hydrologic condition(s) The state of an area pertaining to the amount and timing of water present.

Hydrologic model A conceptual or physically based procedure for numerically simulating a process or processes that occur in a watershed.

Hydrology The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Impoundment Any lake, reservoir, or other containment of surface water occupying a depression or bed in the earth's surface and having a discernible shoreline.

Industrial/Commercial/Institutional (ICI) Self-supplied water associated the production of goods or provision of services by industrial, commercial, or institutional establishments.

Infiltration The movement of water through the soil surface into the soil under the forces of gravity and capillarity.

Inflow 1) The act or process of flowing in or into. 2) The measured quantity of water that has moved into a specific location.

Injection well Refers to a well constructed to inject treated wastewater directly into the ground. Wastewater is generally forced (pumped) into the well for dispersal or storage in a designated aquifer. Injection wells are generally drilled below freshwater levels, or into unused aquifers or aquifers that do not contain drinking water.

Intermediate aquifer system (IAS) This aquifer system consists of five zones of alternating confining and producing units. The producing zones include the Sandstone and Mid-Hawthorn aquifers in the Lower West Coast Planning Area.

Irrigation The application of water to crops and other plants by artificial means to supplement rainfall.

Landscape irrigation The outside watering of shrubbery, trees, lawns, grass, ground covers, vines, gardens, and other such flora, not intended for resale, which are planted and are situated in such diverse locations as residential and recreational areas, cemeteries, public, commercial and industrial establishments, and public medians and rights-of-way.

Level of certainty A water supply planning goal to assure at least a 90 percent probability during any given year that all the needs of reasonable-beneficial water uses will be met, while sustaining water resources and related natural systems during a 1-in-10 year drought event.

Marsh A frequently or continually inundated unforested wetland characterized by emergent herbaceous vegetation adapted to saturated soil conditions.

Million gallons per day (mgd) A rate of flow of water equal to 133,680.56 cubic feet per day, 1.5472 cubic feet per second, or 3.0689 acre-feet per day. A flow of one million gallons per day for one year equals 1,120 acre-feet (365 million gallons).

Minimum Flow and Minimum Water Level (MFL) A flow or level established by the SFWMD pursuant to Sections 373.042 and 373.0421, F.S., for a given water body, at which further withdrawals would be significantly harmful to the water resources or ecology of the area.

Mobile irrigation lab A vehicle furnished with irrigation evaluation equipment that is used to carry out on-site evaluations of irrigation systems and to provide recommendations on improving irrigation efficiency.

Model A computer model is a representation of a system and its operations, and provides a cost-effective way to evaluate future system changes, summarize data, and help understand interactions in complex systems. Hydrologic models are used for evaluating, planning, and simulating the implementation of operations within the SFWMD's water management system under different climatic and hydrologic conditions. Water quality and ecological models are also used to evaluate other processes vital to the health of ecosystems. Groundwater flow models are a numerical representation of water flow and water quality within an aquifer or aquifer system.

Monitor well Any human-made excavation by any method to monitor fluctuations in groundwater levels, quality of underground waters, or the concentration of contaminants in underground waters.

National Geodetic Vertical Datum of 1929 (NGVD29) A geodetic datum derived from a network of information collected in the United States and Canada. It was formerly called the "Sea Level Datum of 1929" or "mean sea level." Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific coasts, it does not necessarily represent local mean sea level at any particular place. As technology has improved and the demand for greater accuracy increased, inherent inaccuracies were uncovered in NGVD29. As a result, NGVD29 has been superseded by the North American Vertical Datum (NAVD) of 1988.

Natural system(s) A self-sustaining living system that supports an interdependent network of aquatic, wetland-dependent, and upland living resources.

Outflow The measured quantity of water that has left an area or water body (through pumping or gravity) during a certain period of time.

Per capita use 1) The average amount of water used per person during a standard time period, generally per day. 2) Total use divided by the total population served.

Permeability The capacity of a porous rock, sediment, or soil for transmitting a fluid.

Planning Area The SFWMD is divided into five areas within which planning activities are focused: Upper Kissimmee Basin (part of the Central Florida Water Initiative), Lower Kissimmee Basin, Upper East Coast, Lower West Coast, and Lower East Coast.

Potable water Water that is suitable for drinking, culinary, or domestic purposes.

Potentiometric head The level to which water will rise when a well is placed in a confined aquifer.

Power Generation (PWR) The difference in the amount of water withdrawn by electric power generating facilities for cooling purposes and the water returned to the hydrologic system near the point of withdrawal.

Priority Water Bodies List and Schedule Required in Section 373.042(2), F.S. of the state's five water management districts to provide the Florida Department of Environmental Protection with an annual list and schedule of specific surface waters and groundwaters with minimum flows and levels and water reservation rules that will be adopted to protect them from the effects of consumptive use allocations.

Process water Water used for nonpotable industrial use, e.g., mixing cement.

Public Water Supply (PWS) Water supplied by water treatment facilities for potable use (drinking quality) with projected average pumpages greater than 0.10 million gallons per day.

Rapid infiltration basin A disposal method by which treated wastewater is applied in deep and permeable deposits of highly porous soils for percolation.

Raw water 1) Water that is direct from the source—groundwater or surface water—without any treatment. 2) Untreated water, usually that entering the first unit of a water treatment plant. Contrast with *Finished Water*.

Raw water demand The amount of water that must be withdrawn from the groundwater or surface water system to meet a particular need. Withdrawal demands are almost always higher than user/customer demands because of treatment and process losses, and inefficiencies associated with delivering water from the source to the end user.

Reasonable-beneficial use Use of water in such quantity as is needed for economic and efficient use for a purpose, which is both reasonable and consistent with the public interest.

Recharge (groundwater) The natural or intentional infiltration of surface water or reclaimed water into the ground to raise groundwater levels.

Reclaimed water Water that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility [Rule 62-610.200, F.A.C.].

Recovery The rate and extent of return of a natural population or community to some aspect(s) of its previous condition. Because of the dynamic nature of ecological systems, the attributes of a "recovered" system should be carefully defined.

Recreational/Landscape Irrigation (REC) Water used for landscape and golf course irrigation. The landscape subcategory includes water used for parks, cemeteries, and other irrigation applications of 0.10 million gallons per day or greater. The golf course subcategory includes operations not supplied by a Public Water Supply or regional reuse facility.

Reservoir An artificial or natural water body used for water storage. Reservoirs can be above or below ground.

Restoration The recovery of a natural system's vitality and biological and hydrological integrity to the extent that the health and ecological functions are self-sustaining over time.

Restricted Allocation Area An area designated within the South Florida Water Management District boundaries for which allocation restrictions are applied regarding the use of specific sources of water. The water resources in these areas are managed in response to specific sources of water in the area for which there is a lack of water availability to meet the projected needs of the region from that specific source of water.

Reuse The deliberate application of reclaimed water for a beneficial purpose. Criteria used to classify projects as "reuse" or "effluent disposal" are contained in Rule 62-610.810, F.A.C. The term "reuse" is synonymous with "water reuse."

Reverse osmosis A treatment process for desalting water using applied pressure to drive the feed water (source water) through a semipermeable membrane.

Rule(s) Of or pertaining to the SFWMD's regulatory programs, which are set forth in various statutes, codes, and criteria.

Runoff That component of rainfall, which is not absorbed by soil, intercepted and stored by surface water bodies, evaporated to the atmosphere, transpired and stored by plants, or infiltrated to groundwater, but which flows to a watercourse as surface water flow.

Salinity Of or relating to chemical salts, usually measured in milligrams per liter (mg/L), or practical salinity units.

Salt water (see *Seawater or Salt water*)

Saltwater interface The hypothetical surface of chloride concentration between fresh water and seawater where the chloride concentration is 250 mg/L at each point on the surface.

Saltwater intrusion The invasion of a body of fresh water by a body of salt water due to its greater density. It can occur either in surface water or groundwater bodies. The term is applied to the flooding of freshwater marshes by seawater, the upward migration of seawater into rivers and navigation channels, and the movement of seawater into freshwater aquifers along coastal regions.

Seawater or **Salt water** Water with a chloride concentration at or above 19,000 mg/L.

Seepage The passage of water or other fluid through a porous medium, such as the passage of water through an earth embankment or masonry wall. Groundwater emerging on the face of a stream bank; the slow movement of water through small cracks, pores, interstices, etc., of a material into or out of a body of surface or subsurface water. The interstitial movement of water that may take place through a dam, its foundation or its abutments. The movement of water by infiltration into the soil from a canal, ditches, laterals, watercourse, reservoir, storage facilities, or other body of water, or from a field. Seepage is generally expressed as flow volume per unit of time.

Seminole Tribe of Florida A federally recognized Indian Tribe organized pursuant to Section 16 of the Indian Reorganization Act of 1934 and recognized by the State of Florida pursuant to Chapter 285, Florida Statutes. The Seminole Tribe of Florida has a surface water entitlement pursuant to the 1987 Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the SFWMD [Public Law 100-228, 101 Statute 1566, and Chapter 87-292, Laws of Florida, as codified in Section 285.165, F.S.].

Serious harm As defined in Chapter 40E-8, F.A.C., the long-term, irreversible, or permanent loss of water resource functions resulting from a change in surface water or groundwater hydrology.

Service area The geographical region in which a water supplier has the ability and the legal right to distribute water for use.

Significant harm As defined in Chapter 40E-8, F.A.C., the temporary loss of water resource functions that results from a change in surface water or groundwater hydrology and takes more than 2 years to recover, but which is considered less severe than serious harm.

Stormwater Water that does not infiltrate but accumulates on land as a result of storm runoff, snowmelt, irrigation, or drainage from impervious surfaces.

Stormwater discharge Precipitation runoff from roadways, parking lots, and roof drains that is collected in gutters and drains. A major source of nonpoint source pollution to water bodies and sewage treatment facilities in municipalities where stormwater is combined with the flow of domestic wastewater (sewage) before entering the wastewater treatment facility.

Stormwater Treatment Area (STA) A system of constructed water quality treatment wetlands that use natural biological processes to reduce levels of nutrients and pollutants from surface water runoff.

Surface water Water above the soil or substrate surface, whether contained in bounds, created naturally or artificially, or diffused. Water from natural springs is classified as surface water when it exits from the spring onto the earth's surface.

Surficial aquifer system (SAS) Often the principal source of water for urban uses. This aquifer is unconfined, consisting of varying amounts of limestone and sediments that extend from the land surface to the top of an intermediate confining unit.

Treatment facility Any facility or other works used for the purpose of treating, stabilizing, or holding water or wastewater.

Tributary A stream that flows into a larger stream or other body of water.

United States Army Corps of Engineers (USACE) As part of the Department of the Army, the USACE has responsibilities in civil and military areas. In civil works, the USACE has authority for approval of dredge and fill permits in navigable waters and tributaries thereof; the USACE enforces wetlands regulations, and constructs and operates a variety of water resources projects, mostly notably levee, dams, and locks.

United States Geological Survey (USGS) The federal agency chartered in 1879 by Congress to classify public lands, and to examine the geologic structure, mineral resources, and products of the national domain. As part of its mission, the USGS provides information and data on the nation's rivers and streams that are useful for mitigation of hazards associated with floods and droughts. The USGS works with partners to monitor, assess, conduct targeted research, and deliver information on a wide range of water resources and conditions, including streamflow, groundwater, water quality, and water use and availability.

Utility Any legal entity responsible for supplying potable water for a defined service area.

Violation (MFL) As defined in Rule 40E-8.021(18), F.A.C., to fall below an adopted minimum flow or level criterion for a duration and frequency greater than specified for the MFL water body. Unless otherwise specified herein, in determining the frequency with which water flows and levels fall below an established MFL for purposes of determining an MFL violation, a "year" means 365 days from the last day of the previous MFL exceedance.

Wastewater The combination of liquid and water-carried pollutants from residences, commercial buildings, industrial plants, and institutions together with any groundwater, surface runoff, or leachate that may be present.

Water conservation The permanent, long-term reduction of daily water use. Permanent water use reduction requires the implementation of water saving technologies and measures that reduce water use while satisfying consumer needs. Water conservation is considered a demand management measure because it reduces the need for future expansion of water supply infrastructure (see *Demand management*).

Water conservation rate structure A water rate structure designed to conserve water. Examples of conservation rate structures include increasing block rates, seasonal rates, and quantity-based surcharges.

Water management The general application of practices to obtain added benefits from precipitation, water or water flow in any of a number of areas, such as irrigation, drainage, wildlife and recreation, navigation, water supply, watershed management, and water storage in soil for crop production. Watershed management is the analysis, protection, development, operation, or maintenance of the land, vegetation, and water resources of a drainage basin for the conservation of all its resources for the benefit of its residents. Watershed management for water production is concerned with the quality, quantity and timing of the water which is produced.

Water quality 1) A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose. 2) The physical, chemical, and biological condition of water as applied to a specific use. Federal and state guidelines set water quality standards based on the water's intended use, whether it is for recreation, fishing, drinking, navigation, shellfish harvesting, or agriculture.

Water Reservation A legal mechanism to set aside water for the protection of fish and wildlife or the public health and safety from consumptive water use. The reservation is composed of a quantification of the water to be protected, which includes a seasonal and a location component.

Water resource development The formulation and implementation of regional water resource management strategies, including collection and evaluation of surface water and groundwater data; structural and nonstructural programs to protect and manage the water resources; development of regional water resource implementation programs; construction, operation and maintenance of major public works facilities to provide for flood control, surface and groundwater storage, and groundwater recharge augmentation; and related technical assistance to local governments and to government-owned and privately owned water utilities [Section 373.019, F.S.].

Water reuse (see *Reuse*)

Watershed A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water. Watersheds conform to federal hydrologic unit code standards and can be divided into subwatersheds and further divided into catchments, the smallest water management unit recognized by SFWMD Operations. Unlike drainage basins, which are defined by Rule, watersheds are continuously evolving as the drainage network evolves.

Water Shortage Plan(s) This effort includes provisions in Chapters 40E-21 and 40E-22, F.A.C., and identifies how water supplies are allocated to users during declared water shortages. The plan allows for supply allotments and cutbacks to be identified on a weekly basis based on the water level within Lake Okeechobee, demands, time of year, and rainfall forecasts.

Water supply development The planning, design, construction, operation, and maintenance of public or private facilities for water collection, production, treatment, transmission, or distribution for sale, resale, or end use [Section 373.019, F.S.].

Water Supply Plan Detailed water supply plan developed by the water management districts under Section 373.709, F.S., providing an evaluation of available water supply and projected demands at the regional scale. The planning process projects future demand for at least 20 years and recommends projects to meet identified needs.

Water table The surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere; defined by the level where water within an unconfined aquifer stands in a well.

Water use Any use of water that reduces the supply from which it is withdrawn or diverted.

Water use permitting The issuance of permits by the South Florida Water Management District, under the authority of Chapter 40E-2, F.A.C., allowing a specified quantity of water withdrawal for consumptive use over a specified time period.

Wellfield One or more wells producing water from a groundwater source. A tract of land that contains a number of wells for supplying a large municipality or irrigation district.

Wetland An area that is inundated or saturated by surface water or groundwater with vegetation adapted for life under those soil conditions (e.g., swamps, bogs, marshes).

Withdrawal Water removed from a groundwater or surface water source for use.

Yield The quantity of water (expressed as rate of flow or total quantity per year) that can be collected for a given use from surface or groundwater sources.

A

Information for Local Governments

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The South Florida Water Management District (SFWMD or District) prepares water supply plans for each of its five planning areas to effectively support planning initiatives and address regional and local issues. The water supply plans address a planning horizon of at least 20 years and are updated every 5 years. Most local governments are required by statute to update their Water Supply Facilities Work Plan (Work Plan) and adopt revisions to their Comprehensive Plan within 18 months following the applicable water supply plan's approval [Section 163.3177(6)(c)3., Florida Statutes (F.S.)].

This appendix contains water supply planning information useful to local governments in preparing and amending Comprehensive Plans. The following chapters and appendices also are relevant for local governments:

Water Source Options	Chapter 5
Utility Areas Served (2017 and 2040)	Appendices B and E
Population Projections (2017–2040)	Chapter 2; Appendix B
Demand Projections (2017–2040)	Chapter 2; Appendices B and E
Water Supply Projects (2017–2040)	Chapter 7

This appendix includes the following information for the review and revision of local government documents:

- Comprehensive Plan requirements (relevant Florida Statutes are provided below)
- Utilities serving local governments

COMPREHENSIVE PLAN REQUIREMENTS

Local governments are required to plan for their water and wastewater needs as well as other infrastructure and public service elements of their Comprehensive Plan. To assist in that effort, the SFWMD developed a general checklist of the types of data and information District staff looks for during review of the water supply element, policies, and other topics in the local government Comprehensive Plans. This checklist is not all-inclusive but provides a general framework for use with the more detailed Florida Department of Economic Opportunity (FDEO) guidelines.

INFO ⓘ

Local Government Planning Documents:

A **Comprehensive Plan** is a document required by statute that details the guidelines, principles, and strategies for responsible growth and development of a community.

A **Water Supply Facilities Work Plan** identifies water supply, conservation, and reuse projects necessary to meet the service area's water needs for at least the next 10 years.

Checklist guidance is given for four water supply-related aspects of Comprehensive Plans:

1. Work Plans
2. Sector Plans
3. Evaluation and appraisal of Comprehensive Plan requirements
4. Plan amendments

LAW/CODE	
Relevant Florida Statutes for Water-Related Aspects of Comprehensive Plans	
Section 163.3767(2)	Requirement for local government to maintain a Comprehensive Plan
Sections 163.3177(4)(a) and 373.709	Coordinate Comprehensive Plan and Work Plan with the applicable regional water supply plan
Section 163.3177(6)(c)	Sanitary sewer and potable water sub-elements
Sections 163.3177(6)(a), (c)3., and (5)	Water Supply Facilities Work Plan
Sections 163.3177(6)(c) and (3)(a)	Level of service standards (per capita use rates) for public facilities
Sections 163.3177(3)(a) and 163.3180(2)	Concurrency and management systems
Sections 163.3177(6)(a) and (c)	Population and water supply demand projections
Sections 163.3177(6)(c) and 373.709(8)(b)	Identify traditional and alternative water supply projects as well as conservation and reuse programs
Section 163.3177(3)	Annual review and updating of the Capital Improvements element and 5-year capital improvement schedule
Section 163.3177(6)(a)	Future land use plan-related Comprehensive Plan amendments
Sections 163.3167(9) and 163.3177(6)(d)	Conservation element amendments of Comprehensive Plan
Section 163.3177(6)(h)	Intergovernmental Coordination element amendments of Comprehensive Plan
Section 163.3191	Evaluation and appraisal review of Comprehensive Plan and Work Plan
Section 163.3245	Sector Plans
Section 163.3177(6)(c)4.	Exemptions to Work Plans

Work Plans

Found within local Comprehensive Plans, Work Plans are part of the link between the regional and local water supply planning efforts. This *2019 Lower Kissimmee Basin Water Supply Plan Update* (2019 LKB Plan Update) provides water demand estimates and water source options to ensure adequate water supplies for the region. The data included in the Work Plans (e.g., population and water demand projections, future projects) should be consistent with the 2019 LKB Plan Update. The SFWMD coordinates with local governments, utilities, regional planning councils, and the FDEO to assist local governments as they update their Work Plans.

Identification of Public Water Suppliers

A local government's Work Plan must identify the Public Water Supply (PWS) entities serving its population. To be consistent with the 2019 LKB Plan Update, Work Plans should identify, at a minimum, the water demands within the local government's boundary and the adequacy of PWS sources to meet those demands. If the local government provides water to or receives water from PWS entities beyond the local government's boundary, the volumes should be identified. This 2019 LKB Plan Update identifies PWS entities with projected average pumpage of 0.10 million gallons per day (mgd) or greater. Smaller utilities are included in the Domestic and Small Public Supply (DSS) category. The FDEO and SFWMD guidance for Work Plans recommends including all small community systems and DSS users on private wells in the local government's Work Plan.

Review of Public Water Supply Utility Summaries

Through coordination with PWS entities, utility summaries were prepared as part of this 2019 LKB Plan Update (**Appendix E**). Summaries contain information such as current and future population projections, per capita use rates, net (finished) water demands (i.e., after any losses due to water treatment), and permitted sources and allocations.

The content of a local government's Work Plan should be in agreement with this 2019 LKB Plan Update's identified water sources and schedule of water sources to be made available to meet projected water demands. However, it is not necessary to use the same population projections or per capita use rates used by the water supply plan to project water demand. Generally accepted professional planning methods may be used as input to the local planning process, which may result in differences between the demand and supply estimates provided in this 2019 LKB Plan Update. If planning assumptions are different from this 2019 LKB Plan Update, the Work Plan should identify and explain the basis for any differences.

Local government Work Plans and the 2019 LKB Plan Update are not required to have the same planning horizon. The minimum planning period for water supply plans is 20 years. Local government Work Plans must have at least a minimum 10-year planning horizon [Section 163.3177(6)(c)3., F.S.], although a 20-year planning horizon is preferred.

To assist local governments in updating their Work Plans, the SFWMD developed technical assistance tools and informational documents, which are available on the SFWMD website (www.sfwmd.gov; Search: Work Plan). Additional information about developing a Work Plan is available from the FDEO website at http://www.floridajobs.org (Community Planning and Development).

Checklist of Key Considerations for Work Plan Amendments

Water Supply Demand Projections

- Revise the adopted Work Plan to be consistent with the water demand estimates and population projections listed in the 2019 LKB Plan Update.
- Plan for gross (raw) and net (finished) water supply demands within the jurisdiction of each supplier.
- Cover at least a 10-year planning period.
- Plan for the building of all public and private water supply facilities.
- Include the purchase of bulk water necessary to provide water supply service within the local government's jurisdiction.
- If a local government provides water outside of its jurisdiction, plan for gross (raw) and net (finished) water supply demands for the area served.
- Provide separate projections for existing and future DSS.

Water Source Identification

- Review the water supply sources identified by the local government or its water suppliers, as necessary, to meet existing and projected water use demand for the established planning period. This information should be compared with the available sources in this plan update.
- Identify the general DSS areas.

Water Supply Project Identification

- Incorporate water supply project(s) selected by the utility or utilities providing PWS to the local government or propose alternatives for inclusion in the Work Plan.
    - All other public and private water supply capital improvements (e.g., wells, treatment plants, distribution systems) necessary to maintain level-of-service standards within the service area should be included in the Work Plan.
- Coordinate the Work Plan water supply projects with this 2019 LKB Plan Update and the water supplier(s) annual progress reports, and update the Work Plan accordingly.
- Identify how water conservation, reclaimed water, and water supply projects will be incorporated to meet projected demands.
- Update the capital improvements element, as required.

Water Supply Intergovernmental Coordination

The Work Plan should address current and future coordination with existing and future water supply and reuse providers for meeting future demands.

- Review existing (2017) and future (2040) service area maps, found at the end of this appendix (**Figure A-1**), for each utility. Compare and update the Work Plan as needed.
  - Identify existing or potential service area conflicts and solutions. Include a conflict resolution policy.
  - Ensure the water supply for all areas of the local government are accounted for by the local governments' own utility or other providers.
- Review and update the Work Plan language concerning needed coordination with water supplier(s), local governments and entities, and others.
  - Include updates to agreements (e.g., bulk service agreements, interconnect agreements).
- Private utilities located within local government service areas should provide utility information to the local government responsible for the Work Plan.

Related Comprehensive Plan Amendments

This 2019 LKB Plan Update may require changes to Work Plans and possibly other elements within Comprehensive Plans. Revisions may include population projections, established planning periods, existing and future water resource projects, intergovernmental coordination activities, conservation and reuse measures, and the capital improvements element.

- If additional revisions are needed for coordination with this 2019 LKB Plan Update but are not listed here, incorporate changes into the Comprehensive Plan and Work Plan, as appropriate.
- Review the Comprehensive Plan for consistency among all sections of the Work Plan and other elements in consideration of all proposed modifications. Other Comprehensive Plan elements that may need updating include future land use, potable water, sanitary sewer, conservation, intergovernmental coordination, and capital improvements.

Sector Plans

A Sector Plan is a long-term plan (20 to 50 years) for a geographic area of at least 5,000 acres. The focus of a Sector Plan, which is included in the Comprehensive Plan, should be on water needs, water source and resource development, and water supply development projects needed to address projected development in the Sector Plan area. Currently, there are no approved Sector Plans in the LKB Planning Area. Additional information on Sector Plans is provided in Section 163.3245, F.S.

Evaluation and Appraisal Review of Comprehensive Plans

At least every 7 years, local governments must evaluate the need to amend their Comprehensive Plan, addressing changes in state requirements since the last Comprehensive Plan update. While an evaluation and appraisal report is not required, local governments are encouraged to evaluate and, as necessary, update Comprehensive Plans to reflect changes in local conditions.

Water Supply Project Identification and Selection

Local governments are encouraged to evaluate water supply projects to address the following issues:

- Identify the extent to which the local government has been successful in identifying water supply projects, including water conservation and reuse, necessary to meet projected demands.
- Evaluate the degree to which the Work Plan has been implemented for building all public and private water supply facilities within the local government's jurisdiction necessary to meet projected demands.
- Provide recommendations for revising the Work Plan and the applicable Comprehensive Plan elements to address the conclusions of the evaluation, as necessary.

Comprehensive Plan Amendments

Water Supply Demand Projections

Comprehensive Plan amendments must address water supply demand projections, including the following:

- Address gross (raw) and net (finished) water supply needs for potable and nonpotable demands, using professionally acceptable methodologies for population projections and per capita use rates.
- Address water conservation and reuse commitments for the proposed future land use change.
- Address the build-out time frame for the proposed changes and the established planning period for the Comprehensive Plan.
- Address any other concerns or information impacting water supply and water demand projections.

Water Source Identification

Comprehensive Plan amendments should identify and include details about the water source(s), including the following:

- For existing demands, reflect water source(s) from supplier's water use permit.
- For future demands covered by a supplier's commitment to provide service under remaining available capacity of an existing water use permit, reflect the source(s) from the supplier's water use permit, including bulk supply contracted quantities, duration, and provider.
- Provide sufficient planning-level data and analysis to demonstrate the availability of a sustainable water source as identified in the appropriate SFWMD water supply plan update when future demands are not covered by an existing water use permit.

Availability of Water Supply and Public Facilities

Comprehensive Plan amendments must include information about the availability of water supply and public facilities for the proposed change, including the following:

- Demonstrate that there is an available gross (raw) water supply from the proposed source(s) for the future land use change, given all other approved land use commitments within the local government's jurisdiction over the proposed amendment's build-out and the established planning period of the Comprehensive Plan.
- Demonstrate that there is sufficient treatment facility capacity and permitted net (finished) water supply for future land use change, given all other commitments for that capacity and supply over the proposed build-out time frame.
- If the availability of water supply and/or public facilities cannot be demonstrated, phasing of the future land use and/or appropriate amendments to the capital improvements element/potable water sub-element will be required to ensure the necessary capital planning and timely availability of the needed infrastructure and water supply.
- If the water provider is an entity other than the local government responsible for the Comprehensive Plan amendment, demonstrate that coordination of the amendment has occurred between the water provider and the local government.

UTILITIES SERVING LOCAL GOVERNMENTS

Table A-1 identifies the local governments within the LKB Planning Area and the PWS utilities with treatment capacity and water use of 0.10 mgd or greater. The first column in **Table A-1** lists the name of the local government, the second column provides the type of utility, and the third column identifies the local government(s) or private PWS utility, or utilities, providing gross (raw) or net (finished) water to the local government.

Table A-2 identifies the PWS utilities providing gross (raw) or net (finished) water to the local governments within the LKB Planning Area. The first column of **Table A-2** lists the name of the PWS utility, the second column provides the type of utility, and the third column identifies the incorporated and unincorporated areas of the LKB Planning Area within that PWS utility's service area.

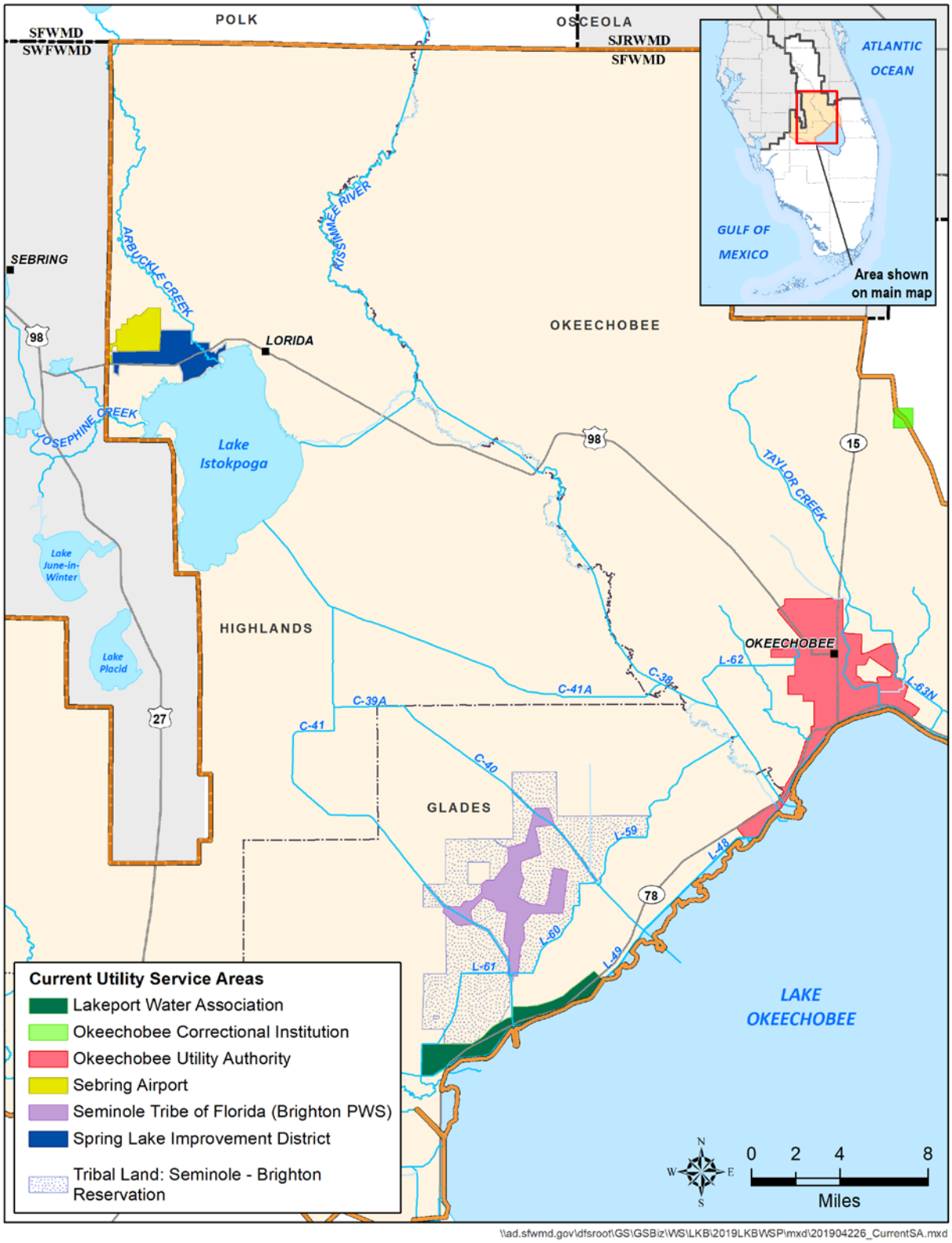
Table A-1. Utilities and entities that serve local governments in the LKB Planning Area.

Local Government	Local Government Utility	Other Utility Serving Local Government
Glades County		
Glades County (unincorporated)	No	Seminole Tribe of Florida* (bulk sales from Brighton Reservation to Lakeport Water Association); Okeechobee Utility Authority
Highlands County		
Highlands County (unincorporated)	No	Spring Lake Improvement District; City of Sebring Utilities Dept. (serving Sebring Regional Airport only)
Sebring, City of	Yes	--
Okeechobee County		
Okeechobee County (unincorporated)	No	Okeechobee Utility Authority; Okeechobee Correctional Institution
Okeechobee, City of	No	Okeechobee Utility Authority

* The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

Table A-2. Utilities and local governments that serve the LKB Planning Area.

Utility Name	Local Government Utility	Local Governments Served
Glades County		
Lakeport Water Association	No	Glades County
Highlands County		
Sebring, City of	Yes	Highlands County (Sebring Regional Airport only), City of Sebring
Spring Lake Improvement District	No	Highlands County
Okeechobee County		
Okeechobee Correctional Institution	No	Okeechobee County
Okeechobee Utility Authority	No	City of Okeechobee; Okeechobee County; and a portion of Glades County



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The South Florida Water Management District (SFWMD or District) develops water demand projections in coordination with stakeholder groups, other agencies, utilities, and local and tribal governments. **Chapter 2** provides summary information and this appendix describes the methods used to develop water demand estimates for 2017 and projections to 2040 for the Lower Kissimmee Basin (LKB) Planning Area.

Water demands for this *2019 Lower Kissimmee Basin Water Supply Plan Update* (2019 LKB Plan Update) are estimated for the six water use categories listed below, which were established by the Florida Department of Environmental Protection (FDEP) in coordination with the state's water management districts. Section 373.709, Florida Statutes (F.S.), states the level-of-certainty planning goal associated with identifying water demands shall be based on meeting demands during 1-in-10 year drought conditions for at least a 20-year period. Therefore, water demand estimates and projections are provided in 5-year increments to 2040 for average rainfall and 1-in-10 year drought conditions. In addition, demands are described and analyzed in two ways: gross (or raw) demand and net (or finished) demand.

- **Public Water Supply (PWS)** – Potable water supplied by water treatment plants with a current allocation of 0.10 million gallons per day (mgd) or greater.
- **Domestic and Small Public Supply (DSS)** – Potable water used by households served by small utilities (less than 0.10 mgd) or self-supplied by private wells.
- **Agricultural Irrigation (AGR)** – Self-supplied water used for commercial crop irrigation, greenhouses, nurseries, livestock watering, pasture, and aquaculture.

- **Industrial/Commercial/Institutional (ICI)** – Self-supplied water associated with the production of goods or provision of services by industrial, commercial, or institutional establishments.
- **Recreational/Landscape Irrigation (REC)** – Self-supplied and reclaimed water used to irrigate golf courses, sports fields, parks, cemeteries, and large common areas such as land managed by homeowners' associations and commercial developments.
- **Power Generation (PWR)** – Self-supplied and reclaimed water used for cooling, potable, and process water by power generation facilities.

POPULATION ESTIMATES AND PROJECTIONS

This section presents the methodology used to develop the 2017 population estimates and 2040 population projections for the LKB Planning Area, which are essential to determining water demands. The University of Florida's Bureau of Economic and Business Research (BEBR) provides population estimates and projections at the county level; however, water supply planning requires population projections at the sub-county level to delineate domestic self-supply and utility service areas for DSS and PWS demands. Section 373.709(2)(a)1., F.S., prescribes the use of population projections in determining water supply needs in regional water supply plans, as follows:

Population projections used for determining public water supply needs must be based upon the best available data. In determining best available data, the district shall consider the University of Florida's Bureau of Economic and Business Research (BEBR) medium population projections and any population projection data and analysis submitted by a local government pursuant to the public workshop described in subsection (1) if the data and analysis support the local government's comprehensive plan. Any adjustment of or deviation from the BEBR projections must be fully described, and the original BEBR data must be presented along with the adjusted data.

Permanent resident estimates and projections for each county, published by BEBR (Rayer and Wang 2018), were used as the basis of population projections in this 2019 LKB Plan Update, in accordance with Section 373.709(2)(a)1., F.S. BEBR county population estimates and projections also are used by local governments in their Comprehensive Plans. Adjustments were made to the medium BEBR projections to include only the portions of Glades, Highlands, and Okeechobee counties within the LKB Planning Area. These adjustments were made based on the distribution of 2010 census blocks in each county (United States Census Bureau 2012). The 2017 permanent resident populations within the LKB Planning Area were as follows:

- Glades County: 4,062 permanent residents
- Highlands County: 8,845 permanent residents
- Okeechobee County: 39,589 permanent residents

Utility Service Areas

To establish current and future PWS and DSS populations, each PWS utility's 2017 and 2040 potable water service area was delineated. A utility service area refers to the area with water distribution infrastructure and water customers served by a particular PWS utility. The SFWMD developed 2017 and 2040 utility service area maps based on information from utilities and the SFWMD's permit database. Spring Lake Improvement District is the only PWS utility with an expanded service area since 2014. Accuracy of the service area maps was verified through correspondence with all PWS utilities.

Population Projection Methodology

Census block populations from the 2010 United States Census (United States Census Bureau 2012) and 2017 PWS service area maps were used to estimate the 2017 permanent resident populations for PWS utilities and DSS areas. Each census block within the LKB Planning Area was assigned to a PWS service area or DSS area. The distribution of population in census blocks not entirely within a single PWS service area or DSS area was based on visual comparison of residential land use coverage. PWS service area and DSS population estimates for 2013 through 2017 were calculated by applying annual county growth rates published by BEBR (Rayer and Wang 2018) to 2010 baseline census estimates. Population projections to 2040 were calculated the same way. County growth rates from BEBR's medium projections were applied to each PWS service area and DSS area within the LKB Planning Area.

Population Projection Results

Table B-1 provides the results of the population distributions by county and PWS utility (or DSS) from 2017 to 2040. The results were shared with and reviewed by utility, municipal, and local and tribal government staff.

Table B-1. Service area population projections in the LKB Planning Area.

County[1]	PWS Utility or DSS	2017	2020	2025	2030	2035	2040
Glades	Lakeport Water Association	1,289	1,330	1,380	1,419	1,458	1,497
	Okeechobee Utility Authority (Glades portion)	1,492	1,539	1,596	1,642	1,688	1,734
	Seminole Tribe of Florida (Brighton Reservation)[2]	703	725	752	773	794	815
	PWS Total	3,484	3,594	3,728	3,834	3,940	4,046
	DSS Total	578	596	618	636	654	672
	Glades County Total	4,062	4,190	4,346	4,470	4,594	4,718
Highlands	Sebring, City of (Airport)[3]	0	0	0	0	0	0
	Spring Lake Improvement District	2,705	2,792	2,917	3,023	3,119	3,201
	PWS Total	2,705	2,792	2,917	3,023	3,119	3,201
	DSS Total	6,140	6,284	6,479	6,633	6,762	6,862
	Highlands County Total	8,845	9,076	9,396	9,656	9,881	10,063
Okeechobee	Okeechobee Utility Authority (Okeechobee portion)	22,146	22,609	23,201	23,739	24,170	24,547
	Okeechobee Correctional Institution	1,900	1,900	1,900	1,900	1,900	1,900
	PWS Total	24,046	24,509	25,101	25,639	26,070	26,447
	DSS Total	15,543	15,908	16,374	16,798	17,137	17,434
	Okeechobee County Total	39,589	40,417	41,475	42,437	43,207	43,881
LKB Planning Area PWS Total		30,235	30,895	31,746	32,496	33,129	33,694
LKB Planning Area DSS Total		22,261	22,788	23,471	24,067	24,553	24,968
LKB Planning Area Total		52,496	53,683	55,217	56,563	57,682	58,662

DSS = Domestic and Small Public Supply; LKB = Lower Kissimmee Basin; PWS = Public Water Supply.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

3 Population projections for the Sebring Airport are zero because there is no permanent population within the service area boundaries.

The populations shown in **Table B-1** indicate the LKB Planning Area will contain 6,166 additional permanent residents by 2040, an increase of approximately 12 percent. The Okeechobee Utility Authority has the largest current and future populations, accounting for 73 percent of the region's projected 2040 PWS population.

Comparing this 2019 LKB Plan Update population projection to that published in the *2014 Lower Kissimmee Basin Water Supply Plan* (2014 LKB Plan; SFWMD 2014) can provide insight into the importance of population growth rates based on BEBR medium projections. Prior to the national economic downturn in 2008, high rates of development in the region pointed to higher population growth rates (**Figure B-1**). The population projections in the *2005-2006 Kissimmee Basin Water Supply Plan Update* (SFWMD 2006) were a result of the higher population growth rates prior to the recession. The BEBR medium projections used in this 2019 LKB Plan Update indicate slower growth rates from previous plans.

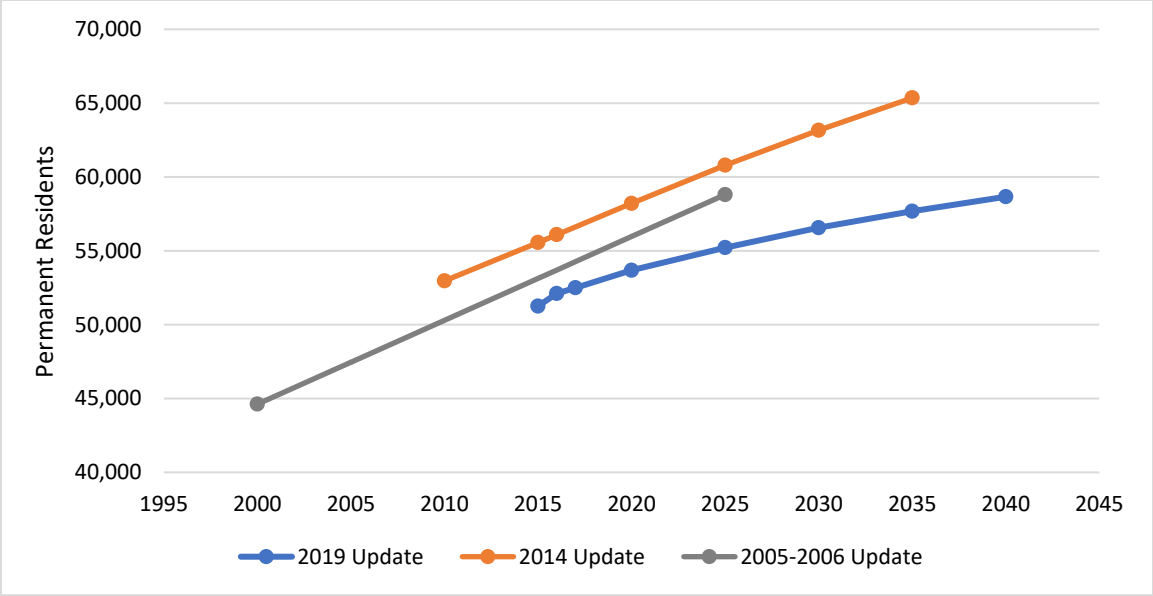

Figure B-1. Comparison of population projections from the 2005-2006 Kissimmee Basin and the 2014 and 2019 LKB water supply plan updates.

PUBLIC WATER SUPPLY

The PWS category includes potable water supplied by water treatment plants with a current allocation of 0.10 mgd or greater. Developing PWS demand projections in the LKB Planning Area was a multistep process that included determining PWS utility service area and DSS populations, calculating per capita use rates (PCURs), and projecting future water needs.

NOTE

Perceived discrepancies in table totals are due to rounding.

PWS Projection Methodology

Per Capita Use Rates

A net (finished) water PCUR was developed for each PWS utility by dividing the annual net (finished) water volume for 2013 through 2017 by the corresponding service area populations (permanent residents) for each year; then, the five annual PCURs were averaged (**Table B-2**). Net (finished) water volumes for 2013 through 2017 were obtained from the PWS utility monthly operating reports submitted to the FDEP. The net (finished) water volume reported to the FDEP includes all water produced for permanent and seasonal residents; industrial, landscaping, and irrigation water supplied by PWS utilities; and any water distribution losses. The resulting PCURs conform to guidance provided by the FDEP for consistent statewide water supply planning. Future water conservation savings were not factored into demand projections and PCURs due to water savings uncertainty. The PCURs for the DSS population in each county were calculated by taking the average PCUR of PWS utilities in each county, weighted by the population. The LKB Planning Area county average PCURs were calculated by averaging PWS and DSS PCURs, weighted by their respective permanent resident populations.

Table B-2. Average net (finished) water per capita use rates (in gallons per capita per day) in the LKB Planning Area.

County[1]	PWS Utility or DSS	2013-2017 Average PCUR
Glades	Lakeport Water Association	75
	Okeechobee Utility Authority (Glades portion)	99
	Seminole Tribe of Florida (Brighton Reservation)[2]	148
	Glades County DSS	100
	Glades County	100
Highlands	Sebring, City of (Airport)	N/A
	Spring Lake Improvement District	70
	Highlands County DSS	70
	Highlands County	70
Okeechobee	Okeechobee Correctional Institution	86
	Okeechobee Utility Authority (Okeechobee portion)	99
	Okeechobee County DSS	99
	Okeechobee County	98
	LKB Planning Area	**82**

DSS = Domestic and Small Public Supply; LKB = Lower Kissimmee Basin; PCUR = per capita use rate; PWS = Public Water Supply.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

Finished to Raw Water Conversion

Net (finished) demands (**Table B-3**) were calculated by multiplying the PWS service area or DSS area population and the 5-year average PCUR. Gross (raw) water withdrawals are the volumes needed from the water source(s) to produce the required net (finished) water volumes considering water treatment process losses. Water use permit allocations are based on the gross (raw) water volume to meet service area demands. To determine gross (raw) water demand for each PWS utility, net (finished) water projections were multiplied by raw-to-finished ratios (**Table B-4**), which are based on the treatment efficiency of each PWS treatment plant. For example, if a typical reverse osmosis treatment facility withdraws a gross (raw) volume of 10 mgd and produces 8 mgd of net (finished) water, its treatment losses are 20 percent. Therefore, its raw-to-finished ratio would be 1.25 (10 mgd divided by 8 mgd).

Treatment efficiencies were determined from information supplied in the water use permit and/or standard treatment process technical documents. The assumed losses are 0 percent for aeration/disinfection only, 3 percent for lime softening/flocculation, 15 percent for nanofiltration, and 25 percent for reverse osmosis. If a utility has more than one treatment method, the ratio reflects combined treatment efficiencies. The only utility with a change in treatment efficiency is the Seminole Tribe of Florida (Brighton Reservation). The utility will begin operating a reverse osmosis treatment system by 2020. Potable water treatment plants in the LKB Planning Area and their treatment processes are shown in **Figure B-2**.

Table B-3. PWS net (finished) water demands under average rainfall conditions in the LKB Planning Area.

County[1]	PWS Utility	Demand – Average Rainfall Conditions (mgd)					
		2017	2020	2025	2030	2035	2040
Glades	Lakeport Water Association	0.10	0.10	0.10	0.11	0.11	0.11
	Okeechobee Utility Authority (Glades portion)	0.15	0.15	0.16	0.16	0.17	0.17
	Seminole Tribe of Florida (Brighton Reservation)[2]	0.10	0.11	0.11	0.11	0.12	0.12
	Glades County Total	**0.35**	**0.36**	**0.37**	**0.38**	**0.39**	**0.41**
Highlands	Sebring, City of (Airport)	0.06	0.06	0.06	0.07	0.07	0.07
	Spring Lake Improvement District	0.19	0.19	0.2	0.21	0.21	0.22
	Highlands County Total	**0.25**	**0.25**	**0.26**	**0.28**	**0.28**	**0.29**
Okeechobee	Okeechobee Correctional Institution	0.16	0.16	0.16	0.16	0.16	0.16
	Okeechobee Utility Authority (Okeechobee portion)	2.19	2.23	2.29	2.34	2.39	2.42
	Okeechobee County Total	**2.35**	**2.4**	**2.45**	**2.51**	**2.55**	**2.59**
LKB Planning Area PWS Total		**2.95**	**3.01**	**3.09**	**3.17**	**3.23**	**3.28**

LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWS = Public Water Supply.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

Table B-4. Raw-to-finished water adjustment ratios for PWS utilities in the LKB Planning Area.

County[1]	PWS Utility	Raw-to-Finished Ratio
Glades	Lakeport Water Association	1.00
	Okeechobee Utility Authority (Glades portion)	1.03
	Seminole Tribe of Florida (Brighton Reservation)[2]	1.25
Highlands	Sebring, City of (Airport)	1.03
	Spring Lake Improvement District	1.00
Okeechobee	Okeechobee Correctional Institution	1.00
	Okeechobee Utility Authority (Okeechobee portion)	1.03

LKB = Lower Kissimmee Basin; PWS = Public Water Supply.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

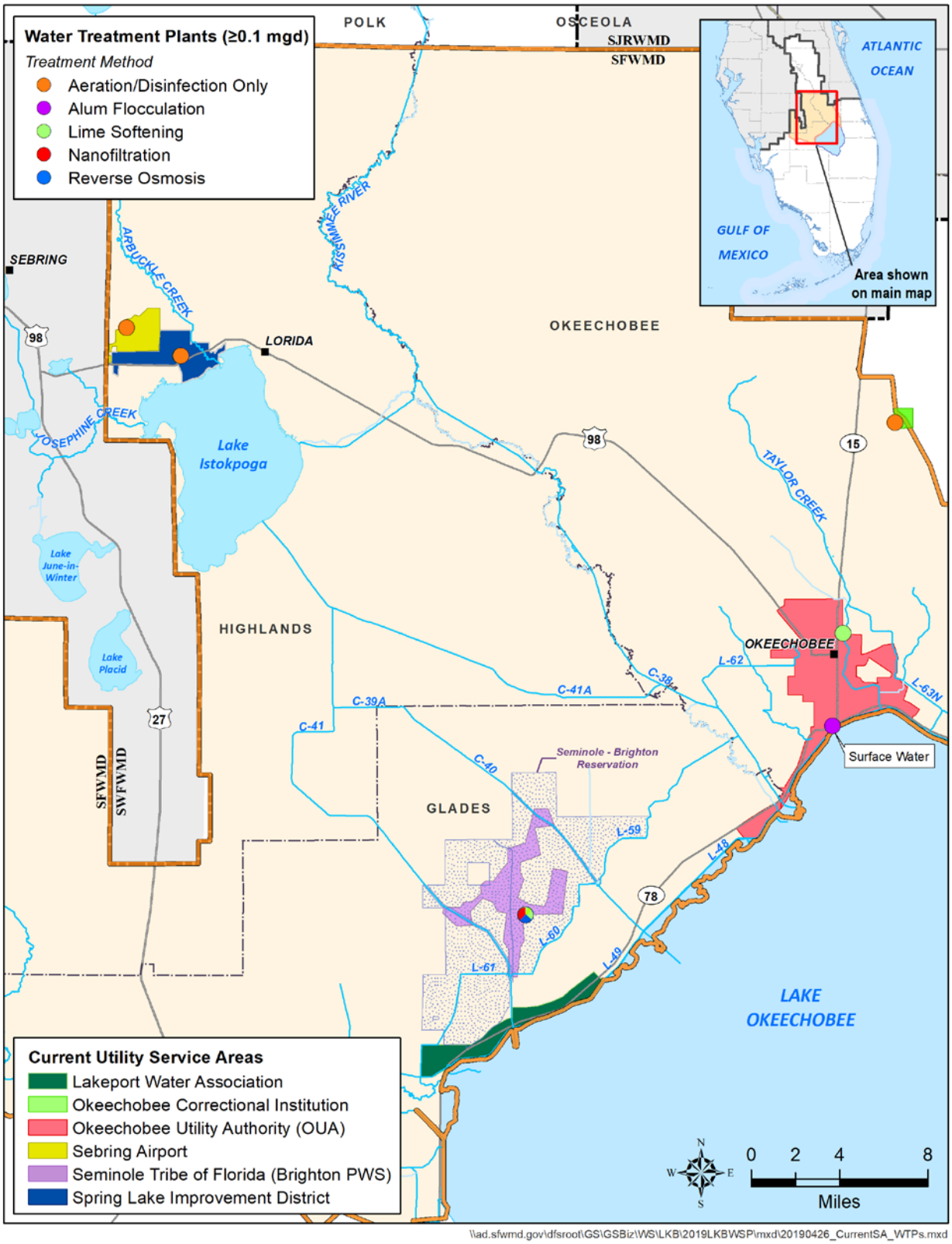

Figure B-2. Potable water treatment plants and Public Water Supply utility service areas in the LKB Planning Area.

PWS Projection Results

Average Rainfall Conditions

Gross (raw) demands for PWS under average rainfall conditions for 2017 through 2040 are provided in **Table B-5**.

Table B-5. PWS gross (raw) water demands under average rainfall conditions in the LKB Planning Area.

County[1]	PWS Utility	Demand – Average Rainfall Conditions (mgd)					
		2017	2020	2025	2030	2035	2040
Glades	Lakeport Water Association	0.10	0.10	0.10	0.11	0.11	0.11
	Okeechobee Utility Authority (Glades portion)	0.15	0.16	0.16	0.17	0.17	0.18
	Seminole Tribe of Florida (Brighton Reservation)[2]	0.12	0.13	0.14	0.14	0.15	0.15
	Glades County Total	**0.37**	**0.39**	**0.41**	**0.42**	**0.43**	**0.44**
Highlands	Sebring, City of (Airport)	0.06	0.06	0.06	0.07	0.07	0.07
	Spring Lake Improvement District	0.12	0.13	0.14	0.14	0.15	0.15
	Highlands County Total	**0.25**	**0.25**	**0.26**	**0.28**	**0.28**	**0.29**
Okeechobee	Okeechobee Correctional Institution	0.16	0.16	0.16	0.16	0.16	0.16
	Okeechobee Utility Authority (Okeechobee portion)	2.25	2.30	2.36	2.41	2.46	2.50
	Okeechobee County Total	**2.42**	**2.46**	**2.52**	**2.58**	**2.62**	**2.66**
LKB Planning Area PWS Total		**3.04**	**3.11**	**3.19**	**3.27**	**3.33**	**3.39**

LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWS = Public Water Supply.

[1] Values listed are only for the areas within the LKB Planning Area boundaries.

[2] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

1-in-10 Year Drought Conditions

Section 373.709, F.S., states that the level-of-certainty planning goal associated with identifying water demands shall be based on meeting demands during 1-in-10 year drought conditions. A 1-in-10 year drought is characterized by diminished rain and increased evapotranspiration relative to the historical record for a particular location. The increased PWS demands during 1-in-10 year drought conditions were calculated using the method described in the *Districtwide Water Supply Assessment* (SFWMD 1998), which considers the increased demands on the irrigation portion of PWS during droughts. The drought demand factor is 1.06 for each county portion within the LKB Planning Area. Average water demands were multiplied by the drought demand factor to calculate demands during 1-in-10 year drought conditions (**Tables B-6** and **B-7**).

NOTE

Average Rainfall and 1-in-10 Year Drought

An **average rainfall** year is defined as a year having rainfall with a 50 percent probability of being exceeded in any other year.

A **1-in-10 year drought** is defined as a year in which below normal rainfall occurs with a 90 percent probability of being exceeded in any other year. It has an expected return frequency of once in 10 years.

Table B-6. PWS net (finished) water demands under 1-in-10 year drought conditions in the LKB Planning Area.

County[1]	PWS Utility	Demand – 1-in-10 Year Drought Conditions (mgd)					
		2017	2020	2025	2030	2035	2040
Glades	Lakeport Water Association	0.10	0.11	0.11	0.11	0.12	0.12
	Okeechobee Utility Authority (Glades portion)	0.16	0.16	0.17	0.17	0.18	0.18
	Seminole Tribe of Florida (Brighton Reservation)[2]	0.11	0.11	0.12	0.12	0.12	0.13
	Glades County Total	**0.37**	**0.38**	**0.40**	**0.41**	**0.42**	**0.43**
Highlands	Sebring, City of (Airport)	0.06	0.06	0.06	0.07	0.07	0.07
	Spring Lake Improvement District	0.20	0.21	0.21	0.22	0.22	0.23
	Highlands County Total	**0.26**	**0.27**	**0.28**	**0.29**	**0.30**	**0.30**
Okeechobee	Okeechobee Correctional Institution	0.17	0.17	0.17	0.17	0.17	0.17
	Okeechobee Utility Authority (Okeechobee portion)	2.32	2.37	2.43	2.49	2.53	2.57
	Okeechobee County Total	**2.49**	**2.54**	**2.60**	**2.66**	**2.70**	**2.74**
LKB Planning Area PWS Total		**3.13**	**3.19**	**3.28**	**3.36**	**3.42**	**3.48**

LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWS = Public Water Supply.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

Table B-7. PWS gross (raw) water demands under 1-in-10 year drought conditions in the LKB Planning Area.

County[1]	PWS Utility	Demand – 1-in-10 Year Drought Conditions (mgd)					
		2017	2020	2025	2030	2035	2040
Glades	Lakeport Water Association	0.10	0.11	0.11	0.11	0.12	0.12
	Okeechobee Utility Authority (Glades portion)	0.16	0.17	0.17	0.18	0.18	0.19
	Seminole Tribe of Florida (Brighton Reservation)[2]	0.13	0.14	0.15	0.15	0.16	0.16
	Glades County Total	**0.39**	**0.41**	**0.43**	**0.44**	**0.45**	**0.47**
Highlands	Sebring, City of (Airport)	0.06	0.06	0.06	0.07	0.07	0.07
	Spring Lake Improvement District	0.20	0.21	0.21	0.22	0.22	0.23
	Highlands County Total	**0.26**	**0.27**	**0.28**	**0.29**	**0.30**	**0.30**
Okeechobee	Okeechobee Correctional Institution	0.17	0.17	0.17	0.17	0.17	0.17
	Okeechobee Utility Authority (Okeechobee portion)	2.39	2.44	2.50	2.56	2.61	2.65
	Okeechobee County Total	**2.56**	**2.61**	**2.68**	**2.73**	**2.78**	**2.82**
LKB Planning Area PWS Total		**3.22**	**3.30**	**3.38**	**3.47**	**3.53**	**3.59**

LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWS = Public Water Supply.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

DOMESTIC AND SMALL PUBLIC SUPPLY

The DSS category includes potable water used by households that are served by small utilities with current allocations less than 0.10 mgd or that are self-supplied by private wells. In the LKB Planning Area, there are no small utilities; therefore, the DSS category only includes households that are self-supplied by private wells. The permanent resident populations within DSS areas were developed simultaneously with the PWS population estimates and projections, as described earlier. To determine the current and future DSS demands, the median PWS PCURs (**Table B-2**) were multiplied by the DSS permanent resident populations in each county. DSS county PCURs remain constant through 2040. For DSS demands, the raw-to-finished water ratio is assumed to be 1.00.

Tables B-8 and **B-9** contain the LKB Planning Area's DSS demand estimates and projections under average rainfall and 1-in-10 year drought conditions. The drought demand factor used for PWS also was used to calculate 1-in-10 year drought DSS demands. The average gross (raw) DSS demands in 2017 were 2.02 mgd for 22,261 permanent residents (**Table B-1**) and are expected to grow to 2.28 mgd in 2040.

Table B-8. DSS gross (raw) water demands under average rainfall conditions in the LKB Planning Area.

County DSS[1]	Demand – Average Rainfall Conditions (mgd)					
	2017	2020	2025	2030	2035	2040
Glades[2]	0.06	0.06	0.06	0.06	0.07	0.07
Highlands	0.43	0.44	0.46	0.47	0.48	0.49
Okeechobee	1.53	1.57	1.62	1.66	1.69	1.72
LKB Planning Area DSS Total	**2.02**	**2.07**	**2.14**	**2.19**	**2.24**	**2.28**

DSS = Domestic and Small Public Supply; LKB = Lower Kissimmee Basin; mgd = million gallons per day.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

Table B-9. DSS gross (raw) water demands under 1-in-10 year drought conditions in the LKB Planning Area.

County DSS[1]	Demand – 1-in-10 Year Drought Conditions (mgd)					
	2017	2020	2025	2030	2035	2040
Glades[2]	0.06	0.06	0.07	0.07	0.07	0.07
Highlands	0.46	0.47	0.49	0.50	0.51	0.52
Okeechobee	1.63	1.67	1.71	1.76	1.79	1.83
LKB Planning Area DSS Total	**2.15**	**2.20**	**2.26**	**2.32**	**2.37**	**2.42**

DSS = Domestic and Small Public Supply; LKB = Lower Kissimmee Basin; mgd = million gallons per day.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

AGRICULTURAL IRRIGATION

Water demands reported under AGR include water used for agricultural production, such as farm irrigation, operation of greenhouses and nurseries, and raising livestock. Water used in the processing of agricultural commodities is accounted for under the ICI category.

The 2014 LKB Plan (SFWMD 2014) relied on various sources to develop agricultural acreage estimates and projections, including agricultural water use permits, parcel-level land use maps, and results from the United States Census of Agriculture. Irrigated acres were translated to water volume (mgd) estimates using the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) model (Smajstrla 1990).

Florida State legislation passed in 2013 prescribed a new approach for water management districts to consider agricultural water demands. Section 570.93, F.S., directs the Florida Department of Agriculture and Consumer Services (FDACS) to develop annual statewide agricultural acreage and water demand projections based on the same 20-year planning horizon used in water supply planning. Under Section 373.709(2)(a), F.S., water management districts are required to consider FDACS projections, and any adjustments or deviations from the projections published by FDACS, "…must be fully described, and the original data must be presented along with the adjusted data."

AGR Projection Methodology

FSAID V Acreage and Demands Data

FDACS publishes 20-year agricultural acreage and associated water demand projections in annual Florida Statewide Agricultural Irrigation Demand (FSAID) reports. The fifth annual report (referred to as FSAID V) was published in 2018 (FDACS 2018). The FSAID V acres (**Tables B-10** and **B-11**) are used in this 2019 LKB Plan Update to calculate AGR demands, with some adjustments.

Table B-10. Unadjusted irrigated agricultural acres in the LKB Planning Area (From: FDACS 2018).

Crop	2016	2020	2025	2030	2035	2040
Hay/Pasture	52,919	52,406	51,691	50,001	47,282	45,971
Citrus	38,631	36,449	35,858	37,395	37,440	37,323
Sugarcane	18,805	20,125	20,125	20,876	21,069	22,028
Sod	10,044	9,761	9,392	8,960	8,314	7,956
Fresh Market Vegetables	6,893	8,620	10,616	10,875	13,576	15,174
Greenhouse/Nursery	3,449	3,304	3,256	3,156	3,117	2,991
Field Crops	1,483	1,483	1,855	1,876	1,867	1,993
Potatoes	551	600	606	517	517	517
Fruit (Non-Citrus)	431	896	896	896	903	903
Total	**133,206**	**133,645**	**134,296**	**134,551**	**134,084**	**134,857**

FDACS = Florida Department of Agriculture and Consumer Services; LKB = Lower Kissimmee Basin.

Table B-11. Unadjusted irrigated agricultural demands (in mgd) in the LKB Planning Area (From: FDACS 2018).

Crop	2016	2020	2025	2030	2035	2040
Hay/Pasture	35.30	33.52	34.50	33.63	32.40	32.07
Citrus	32.61	30.57	30.26	32.60	32.92	33.11
Sugarcane	24.83	27.20	27.41	28.74	29.36	31.03
Sod	8.62	8.66	8.15	7.61	6.92	6.45
Fresh Market Vegetables	10.20	12.76	15.75	16.65	20.39	22.98
Greenhouse/Nursery	8.23	7.63	7.21	6.77	6.51	6.08
Field Crops	1.27	1.24	1.56	1.58	1.57	1.67
Potatoes	0.60	0.66	0.68	0.58	0.59	0.59
Fruit (Non-Citrus)	0.77	1.80	1.83	1.87	1.92	1.96
Total	**122.44**	**124.05**	**127.35**	**130.03**	**132.57**	**135.95**

FDACS = Florida Department of Agriculture and Consumer Services; LKB = Lower Kissimmee Basin; mgd = million gallons per day.

SFWMD staff identified FSAID V parcels for removal from irrigated acreage based on visual inspection of historical aerial imagery, recent regulatory water use data, and the location of recently implemented surface water management or environmental restoration projects. As a result of this inspection process, FSAID V irrigated area was reduced by 14,172 acres in 2017 and 11,739 acres in 2040. All edits were made in coordination with FDACS and have been integrated into the FSAID VI report. **Table B-10** represents the unadjusted LKB Planning Area irrigated acres as published by FDACS. The FSAID V demands in **Table B-11** and **Figure B-3** also are unadjusted. Adjusted FSAID V irrigated acres are presented throughout this 2019 LKB Plan Update unless noted otherwise. FSAID V only published estimates for 2016; they are considered representative of 2017 estimates.

The adjusted FSAID V acreage estimates and projections are used in this 2019 LKB Plan Update; however, water demands were calculated separately by SFWMD staff using the AFSIRS model. AGR demands published in the 2014 LKB Plan (SFWMD 2014) and in other regional water supply plans were developed using the AFSIRS model. Alternative demands developed using adjusted FSAID V acreages and the AFSIRS model were evaluated with the demands published in FSAID V, as described below.

Comparison of FSAID V and AFSIRS Demands

The estimated 2017 and projected 2040 demands from the AFSIRS model using adjusted irrigated agricultural acres were compared to the FSAID V report using unadjusted irrigated agricultural acres, and they differed by more than 100 mgd despite sharing a similar irrigated acreage footprint (**Figure B-3**).

The SFWMD uses AFSIRS to estimate demands simulated in regional groundwater models, and the demands using AFSIRS resemble those obtained through the SFWMD's permitting methods. After reviewing water demands from FSAID V and AFSIRS, the SFWMD chose to use water demand estimates and projections from AFSIRS based on irrigated acres published in the FSAID V report (FDACS 2018) with acreage adjustments described earlier. The decision to deviate from water demands published in the FSAID V report (FDACS 2018) was made to maintain a consistent approach with previous planning and regional modeling efforts.

Data for soil type, rainfall, reference evapotranspiration, and irrigation method are among the key inputs used with AFSIRS to calculate current and future demands. Soil input data were obtained from the Natural Resources Conservation Service's SSURGO database (https://websoilsurvey.nrcs.usda.gov). Daily rainfall data were obtained from the SFWMD's Next Generation Radar (NEXRAD) rainfall data set. Reference evapotranspiration data were obtained from the United States Geological Survey's Statewide Evapotranspiration Information and Data database (http://fl.water.usgs.gov/et/). The irrigation method for each irrigated parcel used with AFSIRS is provided in the FSAID V data set. Most citrus groves are irrigated via micro-spray. Flood irrigation is the most common method for all other crop categories.

Water demands associated with livestock and aquaculture production complete the demands for the AGR category. Demands for these activities are taken directly from the FSAID V report (FDACS 2018) without adjustment.

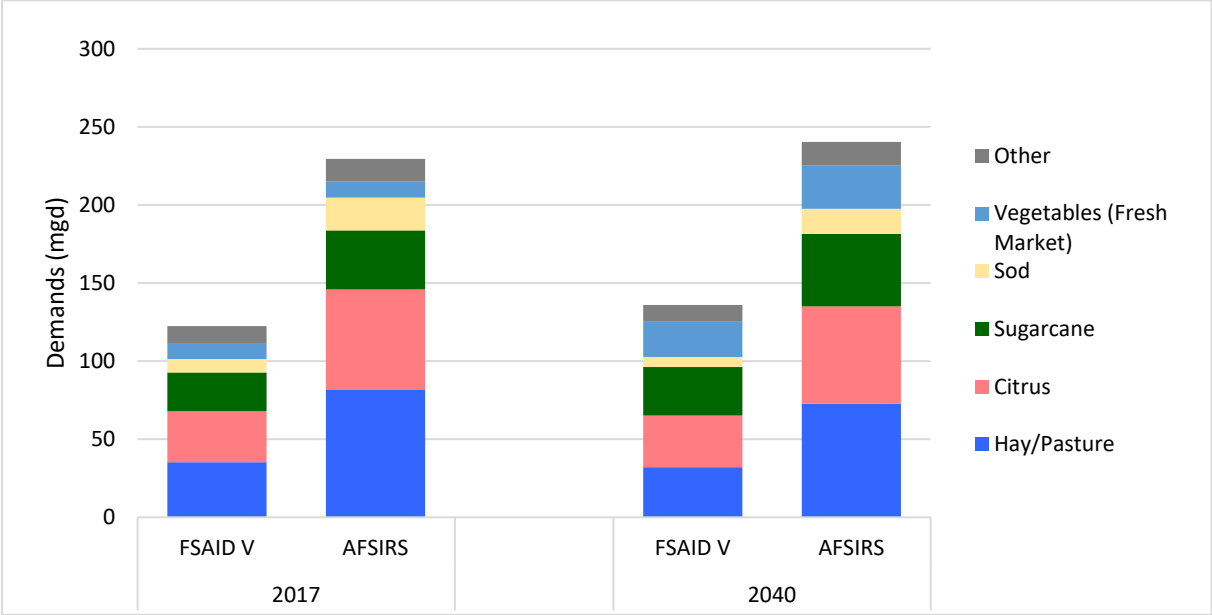

Figure B-3. Comparison of average water demands from the fifth Florida Statewide Agricultural Irrigation Demand (FSAID V) report and the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS). (Note: The "Other" category includes commodities from **Table B-11** that are not graphed individually.)

AGR Projection Results

AGR acres and water demands depend on the choices of individual agricultural producers from year to year. Those choices are affected by several factors, including weather, markets, disease, proprietary information, and urban development pressure. AGR projections can be affected by population changes as well as future land use conversions.

The gross irrigation requirements for various crop types under the AGR category are provided in **Tables B-12** to **B-20**. **Tables B-21** and **B-22** summarize the gross water requirements for livestock and aquaculture. **Table B-23** summarizes all agricultural acreage in the LKB Planning Area, and **Table B-24** summarizes the gross irrigation requirements for all agricultural acreage in the region.

Hay/Pasture

Table B-12 presents the SFWMD's hay/pasture acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10 year drought conditions. The FSAID acres for this category are labeled and modeled as hay. The associated demands calculated with AFSIRS are assumed to capture irrigation for hay and any irrigation used for improved pasture.

Table B-12. Gross irrigation demands (in mgd) for hay/pasture acreage in the LKB Planning Area.

	2017	2020	2025	2030	2035	2040
Glades County*						
Irrigated acres	16,755	16,755	17,527	17,668	17,682	17,682
Average rainfall	33.33	33.33	34.58	34.88	34.90	34.90
1-in-10 year drought	39.49	39.49	40.98	41.33	41.36	41.36
Highlands County*						
Irrigated acres	18,581	18,222	17,691	16,867	14,806	14,263
Average rainfall	35.15	34.49	33.57	32.03	28.35	27.43
1-in-10 year drought	41.23	40.45	39.35	37.54	33.21	32.11
Okeechobee County*						
Irrigated acres	7,710	7,710	6,851	6,710	6,172	5,947
Average rainfall	13.42	13.42	11.76	11.55	10.73	10.38
1-in-10 year drought	16.34	16.34	14.38	14.12	13.08	12.64
LKB Planning Area Total						
Irrigated acres	**43,046**	**42,687**	**42,069**	**41,244**	**38,660**	**37,892**
Average rainfall	**81.90**	**81.24**	**79.92**	**78.46**	**73.99**	**72.71**
1-in-10 year drought	**97.05**	**96.28**	**94.72**	**92.99**	**87.66**	**86.11**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.

Hay Farming

Citrus

Table B-13 presents the SFWMD's citrus acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10 year drought conditions.

Table B-13. Gross irrigation demands (in mgd) for citrus acreage in the LKB Planning Area.

	2017	2020	2025	2030	2035	2040
Glades County*						
Irrigated acres	3,676	3,690	4,987	7,314	8,113	8,991
Average rainfall	6.78	6.80	9.20	13.01	14.74	16.20
1-in-10 year drought	8.48	8.51	11.34	16.10	18.17	19.99
Highlands County*						
Irrigated acres	32,233	30,572	28,825	28,026	27,436	26,473
Average rainfall	52.51	50.04	46.90	45.59	44.69	43.17
1-in-10 year drought	64.90	61.81	58.01	56.39	55.25	53.37
Okeechobee County*						
Irrigated acres	2,407	1,873	1,727	1,660	1,493	1,493
Average rainfall	4.74	3.82	3.48	3.32	2.99	2.99
1-in-10 year drought	5.85	4.67	4.27	4.08	3.67	3.67
LKB Planning Area Total						
Irrigated acres	38,316	36,135	35,539	37,000	37,043	36,957
Average rainfall	**64.03**	**60.67**	**59.58**	**61.92**	**62.43**	**62.37**
1-in-10 year drought	**79.22**	**74.98**	**73.61**	**76.57**	**77.09**	**77.04**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.

Citrus Grove

Sugarcane

Table B-14 presents the SFWMD's sugarcane acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10 year drought conditions.

Table B-14. Gross irrigation demands (in mgd) for sugarcane acreage in the LKB Planning Area.

	2017	2020	2025	2030	2035	2040
Glades County*						
Irrigated acres	13,608	15,529	15,529	16,277	17,196	18,152
Average rainfall	29.76	34.30	34.30	36.15	37.48	39.87
1-in-10 year drought	35.25	40.52	40.52	42.67	44.27	47.00
Highlands County*						
Irrigated acres	3,828	3,828	3,828	3,828	3,099	3,099
Average rainfall	8.05	8.05	8.05	8.05	6.53	6.53
1-in-10 year drought	9.24	9.24	9.24	9.24	7.48	7.48
Okeechobee County*						
Irrigated acres	0	0	0	0	0	0
Average rainfall	0.00	0.00	0.00	0.00	0.00	0.00
1-in-10 year drought	0.00	0.00	0.00	0.00	0.00	0.00
LKB Planning Area Total						
Irrigated acres	**17,436**	**19,357**	**19,357**	**20,104**	**20,294**	**21,250**
Average rainfall	**37.82**	**42.36**	**42.36**	**44.21**	**44.00**	**46.40**
1-in-10 year drought	**44.48**	**49.76**	**49.76**	**51.91**	**51.75**	**54.48**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.

Sugarcane

Sod

Table B-15 presents the SFWMD's sod acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10 year drought conditions.

Table B-15. Gross irrigation demands (in mgd) for sod acreage in the LKB Planning Area.

	2017	2020	2025	2030	2035	2040
Glades County*						
Irrigated acres	504	504	504	504	504	504
Average rainfall	1.34	1.34	1.34	1.34	1.34	1.34
1-in-10 year drought	1.57	1.57	1.57	1.57	1.57	1.57
Highlands County*						
Irrigated acres	6,926	6,728	6,389	5,957	5,451	5,094
Average rainfall	16.51	16.04	15.15	14.17	13.05	12.18
1-in-10 year drought	19.01	18.47	17.42	16.29	14.98	13.98
Okeechobee County*						
Irrigated acres	1,247	1,247	1,216	1,216	1,076	1,076
Average rainfall	3.09	3.09	2.99	2.99	2.60	2.60
1-in-10 year drought	3.70	3.70	3.59	3.59	3.12	3.12
LKB Planning Area Total						
Irrigated acres	**8,677**	**8,479**	**8,110**	**7,677**	**7,031**	**6,674**
Average rainfall	**20.94**	**20.47**	**19.49**	**18.51**	**16.99**	**16.12**
1-in-10 year drought	**24.28**	**23.73**	**22.58**	**21.45**	**19.66**	**18.66**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.

Sod Farm

Fresh Market Vegetables

Table B-16 presents the SFWMD's fresh market vegetable acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10 year drought conditions, assuming 2 plantings per year lasting 4 months each.

Table B-16. Gross irrigation demands (in mgd) for fresh market vegetable acreage in the LKB Planning Area.

	2017	2020	2025	2030	2035	2040
Glades County*						
Irrigated acres	251	2,056	4,150	4,613	8,031	9,900
Average rainfall	0.51	4.43	8.87	9.55	16.81	20.58
1-in-10 year drought	0.59	5.12	10.27	11.06	19.38	23.72
Highlands County*						
Irrigated acres	2,776	2,728	2,624	2,466	2,263	2,189
Average rainfall	5.58	5.48	5.27	4.94	4.53	4.38
1-in-10 year drought	6.54	6.42	6.17	5.79	5.31	5.13
Okeechobee County*						
Irrigated acres	2,021	1,984	1,984	1,984	1,450	1,295
Average rainfall	4.18	4.11	4.11	4.11	3.00	2.71
1-in-10 year drought	4.86	4.77	4.77	4.77	3.49	3.15
LKB Planning Area Total						
Irrigated acres	**5,047**	**6,769**	**8,757**	**9,063**	**11,744**	**13,384**
Average rainfall	**10.27**	**14.02**	**18.24**	**18.60**	**24.35**	**27.67**
1-in-10 year drought	**11.98**	**16.31**	**21.20**	**21.61**	**28.19**	**32.00**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.

Tomato Crop

Greenhouse/Nursery

Table B-17 presents the SFWMD's greenhouse/nursery acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10 year drought conditions.

Table B-17. Gross irrigation demands (in mgd) for greenhouse/nursery acreage in the LKB Planning Area.

	2017	2020	2025	2030	2035	2040
Glades County*						
Irrigated acres	325	325	325	325	325	325
Average rainfall	0.85	0.85	0.85	0.85	0.85	0.85
1-in-10 year drought	0.99	0.99	0.99	0.99	0.99	0.99
Highlands County*						
Irrigated acres	2,006	1,872	1,824	1,724	1,724	1,623
Average rainfall	4.71	4.39	4.28	4.04	4.04	3.80
1-in-10 year drought	5.30	4.94	4.81	4.55	4.55	4.28
Okeechobee County*						
Irrigated acres	1,023	1,011	1,011	1,011	972	964
Average rainfall	2.42	2.40	2.40	2.40	2.30	2.29
1-in-10 year drought	2.64	2.62	2.62	2.62	2.52	2.50
LKB Planning Area Total						
Irrigated acres	**3,353**	**3,208**	**3,160**	**3,059**	**3,020**	**2,912**
Average rainfall	**7.98**	**7.64**	**7.53**	**7.29**	**7.20**	**6.95**
1-in-10 year drought	**8.94**	**8.55**	**8.43**	**8.16**	**8.06**	**7.78**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.

Florida Nursery

Field Crops

Table B-18 presents the SFWMD's field crops acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10 year drought conditions. The field crops category includes soybeans, field corn, peanuts, dried beans, lentils, and other grains.

Table B-18. Gross irrigation demands (in mgd) for field crop acreage in the LKB Planning Area.

	2017	2020	2025	2030	2035	2040
Glades County*						
Irrigated acres	0	0	504	526	566	692
Average rainfall	0.00	0.00	1.26	1.32	1.41	1.67
1-in-10 year drought	0.00	0.00	1.46	1.52	1.63	1.92
Highlands County*						
Irrigated acres	1,703	1,703	1,569	1,569	1,518	1,518
Average rainfall	3.31	3.31	3.01	3.01	2.90	2.90
1-in-10 year drought	3.96	3.96	3.60	3.60	3.47	3.47
Okeechobee County*						
Irrigated acres	472	472	472	424	424	424
Average rainfall	0.95	0.95	0.95	0.86	0.86	0.86
1-in-10 year drought	1.11	1.11	1.11	1.00	1.00	1.00
LKB Planning Area Total						
Irrigated acres	**2,175**	**2,175**	**2,545**	**2,518**	**2,509**	**2,634**
Average rainfall	**4.26**	**4.26**	**5.22**	**5.18**	**5.17**	**5.42**
1-in-10 year drought	**5.07**	**5.07**	**6.17**	**6.12**	**6.10**	**6.39**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.

Corn Field

Potatoes

Table B-19 presents the SFWMD's potatoes acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10 year drought conditions.

Table B-19. Gross irrigation demands (in mgd) for potato acreage in the LKB Planning Area.

	2017	2020	2025	2030	2035	2040
Glades County*						
Irrigated acres	228	277	283	283	283	283
Average rainfall	0.57	0.68	0.70	0.70	0.70	0.70
1-in-10 year drought	0.66	0.79	0.81	0.81	0.81	0.81
Highlands County*						
Irrigated acres	0	0	0	0	0	0
Average rainfall	0.00	0.00	0.00	0.00	0.00	0.00
1-in-10 year drought	0.00	0.00	0.00	0.00	0.00	0.00
Okeechobee County*						
Irrigated acres	323	323	323	234	234	234
Average rainfall	0.69	0.69	0.69	0.50	0.50	0.50
1-in-10 year drought	0.81	0.81	0.81	0.59	0.59	0.59
LKB Planning Area Total						
Irrigated acres	**551**	**600**	**606**	**517**	**517**	**517**
Average rainfall	**1.26**	**1.37**	**1.39**	**1.20**	**1.20**	**1.20**
1-in-10 year drought	**1.47**	**1.60**	**1.62**	**1.40**	**1.40**	**1.40**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.

Potato Crop

Fruit (Non-Citrus)

Table B-20 presents the SFWMD's fruit (non-citrus) acreage and gross irrigation requirement (water withdrawal demand) projections under average rainfall and 1-in-10 year drought conditions.

Table B-20. Gross irrigation demands (in mgd) for fruit (non-citrus) acreage in the LKB Planning Area.

	2017	2020	2025	2030	2035	2040
Glades County*						
Irrigated acres	0	462	462	462	468	468
Average rainfall	0.00	0.73	0.73	0.73	0.74	0.74
1-in-10 year drought	0.00	0.84	0.84	0.84	0.86	0.86
Highlands County*						
Irrigated acres	409	409	409	409	409	409
Average rainfall	0.97	0.97	0.97	0.97	0.97	0.97
1-in-10 year drought	1.09	1.09	1.09	1.09	1.09	1.09
Okeechobee County*						
Irrigated acres	23	23	23	23	23	23
Average rainfall	0.06	0.06	0.06	0.06	0.06	0.06
1-in-10 year drought	0.06	0.06	0.06	0.06	0.06	0.06
LKB Planning Area Total						
Irrigated acres	**431**	**893**	**893**	**893**	**900**	**900**
Average rainfall	**1.03**	**1.76**	**1.76**	**1.76**	**1.78**	**1.78**
1-in-10 year drought	**1.15**	**1.99**	**1.99**	**1.99**	**2.01**	**2.01**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.

Strawberry Harvest

Livestock

Table B-21 presents the FSAID V water demand projections for livestock. Livestock demands published in the FSAID V report (FDACS 2018) were developed with assumed water requirements per head of livestock. Livestock demands are assumed to be the same under average rainfall and 1-in-10 year drought conditions.

Cattle Ranch

Table B-21. Gross water demands (in mgd) for livestock in the LKB Planning Area.

2017	2020	2025	2030	2035	2040
Glades County*					
0.51	0.51	0.51	0.51	0.51	0.51
Highlands County*					
2.18	2.18	2.18	2.18	2.18	2.18
Okeechobee County*					
4.25	4.25	4.25	4.25	4.25	4.25
LKB Planning Area Total					
6.94	**6.94**	**6.94**	**6.94**	**6.94**	**6.94**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.
Note: Water demands for livestock were obtained from the fifth Florida Statewide Agricultural Irrigation Demand (FSAID V) report, not calculated using the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) model.

Aquaculture

Table B-22 presents the FSAID V water demand projections for aquaculture. Aquaculture demands are assumed to be the same under average rainfall and 1-in-10 year drought conditions.

Table B-22. Gross water demands (in mgd) for aquaculture in the LKB Planning Area.

2017	2020	2025	2030	2035	2040
Glades County*					
0.36	0.36	0.36	0.36	0.36	0.36
Highlands County*					
0.10	0.10	0.10	0.10	0.10	0.10
Okeechobee County*					
0.13	0.13	0.13	0.13	0.13	0.13
LKB Planning Area Total					
0.60	**0.60**	**0.60**	**0.60**	**0.60**	**0.60**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.
Note: Water demands for aquaculture were obtained from the fifth Florida Statewide Agricultural Irrigation Demand (FSAID V) report, not calculated using the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) model.

Summary of Agricultural Results

Irrigated agricultural acres are projected to increase 3 percent over the planning horizon, from 119,034 to 123,118 acres (**Tables B-23** and **B-24**). Highlands and Okeechobee counties are projected to experience reductions in demands, while demands in Glades County are projected to increase (**Table B-23**). Irrigated hay and pasture will continue to dominate AGR demands, accounting for 30 percent of the 2040 total AGR demand (**Table B-24**). The largest increase in demands is projected for the fresh market vegetables category. Fresh market vegetable demands are projected to grow more than 17 mgd. Overall, LKB Planning Area total gross water demands under average rainfall conditions for AGR are projected to increase approximately 3 percent, from 237.02 mgd in 2017 to 248.14 mgd in 2040.

Table B-23. Summary of gross water demands (in mgd) for all agricultural acreage, livestock, and aquaculture in the LKB Planning Area, by county.

	2017	2020	2025	2030	2035	2040
Glades County*						
Irrigated acres	35,347	39,598	44,271	47,971	53,169	56,996
Average rainfall	74.02	83.34	92.72	99.41	109.86	117.74
1-in-10 year drought	87.89	98.70	109.65	117.75	129.91	139.09
Highlands County*						
Irrigated acres	68,462	66,062	63,158	60,845	56,706	54,668
Average rainfall	129.07	125.07	119.48	115.09	107.35	103.64
1-in-10 year drought	153.54	148.66	141.97	136.77	127.62	123.19
Okeechobee County*						
Irrigated acres	15,225	14,642	13,606	13,260	11,844	11,454
Average rainfall	33.93	32.90	30.81	30.16	27.42	26.75
1-in-10 year drought	39.74	38.45	35.99	35.20	31.91	31.11
LKB Planning Area Total						
Irrigated acres	**119,034**	**120,302**	**121,035**	**122,076**	**121,719**	**123,118**
Average rainfall	**237.02**	**241.31**	**243.01**	**244.66**	**244.63**	**248.14**
1-in-10 year drought	**281.18**	**285.81**	**287.61**	**289.72**	**289.44**	**293.39**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.
* Values listed are only for the areas within the LKB Planning Area boundaries.

Table B-24. Summary of gross water demands (in mgd) for all agricultural acreage, livestock, and aquaculture in the LKB Planning Area, by commodity.

	2017	2020	2025	2030	2035	2040
Sugarcane						
Irrigated acres	17,436	19,357	19,357	20,104	20,294	21,250
Average rainfall	37.82	42.36	42.36	44.21	44.00	46.40
1-in-10 year drought	44.48	49.76	49.76	51.91	51.75	54.48
Fresh Market Vegetables						
Irrigated acres	5,047	6,769	8,757	9,063	11,744	13,384
Average rainfall	10.27	14.02	18.24	18.60	24.35	27.67
1-in-10 year drought	11.98	16.31	21.20	21.61	28.19	32.00
Citrus						
Irrigated acres	38,316	36,135	35,539	37,000	37,043	36,957
Average rainfall	64.03	60.67	59.58	61.92	62.43	62.37
1-in-10 year drought	79.22	74.98	73.61	76.57	77.09	77.04
Hay/Pasture						
Irrigated acres	43,046	42,687	42,069	41,244	38,660	37,892
Average rainfall	81.90	81.24	79.92	78.46	73.99	72.71
1-in-10 year drought	97.05	96.28	94.72	92.99	87.66	86.11
Greenhouse/Nursery						
Irrigated acres	3,353	3,208	3,160	3,059	3,020	2,912
Average rainfall	7.98	7.64	7.53	7.29	7.20	6.95
1-in-10 year drought	8.94	8.55	8.43	8.16	8.06	7.78
Fruit (Non-Citrus)						
Irrigated acres	431	893	893	893	900	900
Average rainfall	1.03	1.76	1.76	1.76	1.78	1.78
1-in-10 year drought	1.15	1.99	1.99	1.99	2.01	2.01
Sod						
Irrigated acres	8,677	8,479	8,110	7,677	7,031	6,674
Average rainfall	20.94	20.47	19.49	18.51	16.99	16.12
1-in-10 year drought	24.28	23.73	22.58	21.45	19.66	18.66
Potatoes						
Irrigated acres	551	600	606	517	517	517
Average rainfall	1.26	1.37	1.39	1.20	1.20	1.20
1-in-10 year drought	1.47	1.60	1.62	1.40	1.40	1.40
Field Crops						
Irrigated acres	2,175	2,175	2,545	2,518	2,509	2,634
Average rainfall	4.26	4.26	5.22	5.18	5.17	5.42
1-in-10 year drought	5.07	5.07	6.17	6.12	6.10	6.39
Livestock						
Irrigated acres	--	--	--	--	--	--
Average rainfall	6.94	6.94	6.94	6.94	6.94	6.94
1-in-10 year drought	6.94	6.94	6.94	6.94	6.94	6.94
Aquaculture						
Irrigated acres	--	--	--	--	--	--
Average rainfall	0.60	0.60	0.60	0.60	0.60	0.60
1-in-10 year drought	0.60	0.60	0.60	0.60	0.60	0.60
LKB Planning Area Total						
Irrigated acres	**119,034**	**120,301**	**121,035**	**122,076**	**121,718**	**123,118**
Average rainfall	**237.02**	**241.31**	**243.01**	**244.66**	**244.63**	**248.14**
1-in-10 year drought	**281.18**	**285.81**	**287.61**	**289.72**	**289.44**	**293.39**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.

INDUSTRIAL/COMMERCIAL/INSTITUTIONAL

The ICI water use category includes demands associated with industrial and commercial operations for processing, manufacturing, and technical needs such as concrete, citrus and vegetable processing, and mining operations. ICI demands only include self-supplied users and do not include industrial or commercial users that receive water from PWS utilities; those users are included in the PWS category. Recirculated water used in closed-loop geothermal heating and cooling systems is not included in demand calculations. Although a large portion of ICI water used by the mining industry for activities such as rock washing is returned to the source, all mining water use is included in demand estimates and projections. All ICI demand estimates and projections are presumed to be the same for average rainfall and 1-in-10 year drought conditions.

ICI Projection Methodology

ICI estimates and projections are based on water use data from the SFWMD's regulatory database. If an active ICI permit holder did not report water use, demand estimates were calculated as described in the *2017 Estimated Water Use Report* (SFWMD 2018).

In the LKB Planning Area, mining operations account for 39 percent of 2017 ICI demands. Growth within the ICI category is expected to be driven by sand, gravel, and stone mining supporting new construction from regional population growth. Therefore, ICI projections are anticipated to grow at the same rate as county permanent resident populations. Previous analyses of the relationship between mining water use and permanent resident population support this approach.

ICI Projection Results

Table B-25 summarizes the current and projected ICI demands in the LKB Planning Area in 5-year increments through 2040. Highlands County maintains a dominant share of the region's ICI demands over the planning horizon.

Table B-25. ICI demand projections in the LKB Planning Area.

County[1]	Demand (mgd)					
	2017	2020	2025	2030	2035	2040
Glades[2]	0.68	0.70	0.73	0.75	0.77	0.79
Highlands	0.95	0.97	1.01	1.03	1.06	1.08
Okeechobee	0.07	0.08	0.08	0.08	0.08	0.08
LKB Planning Area Total	**1.70**	**1.75**	**1.81**	**1.86**	**1.91**	**1.95**

ICI = Industrial/Commercial/Institutional; LKB = Lower Kissimmee Basin; mgd = million gallons per day.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

RECREATIONAL/LANDSCAPE IRRIGATION

REC water demands include irrigation for golf courses and other landscaped areas such as parks, sports fields, and homeowners' association common areas. Demands are calculated only for REC areas with water use permits issued by the SFWMD. All REC demands are calculated using AFSIRS model results.

There are three types of irrigated landscaped areas outside of those permitted by the SFWMD that are excluded from the REC demands. The first type includes landscaped areas irrigated with potable water provided PWS utilities. These demands are accounted for under PWS estimates and projections. The second type is irrigated landscaped areas served by individual residential wells permitted by rule [Rule 40E-2.061, Florida Administrative Code] rather than with an individual water use permit. Demands associated with small residential wells are not quantified as part of this 2019 LKB Plan Update due to the lack of water use and acreage data. The third type of irrigated landscaped areas are those served with reclaimed water that do not require a water use permit. Reclaimed water is a major source for the irrigation of permitted and non-permitted landscaped areas in other planning areas; however, reclaimed water currently is not used for these purposes within the LKB Planning Area. No new uses of reclaimed water under the REC water use category are expected over the planning horizon.

REC Projection Methodology

REC demands are quantified in multiple ways. The distinction is made between REC demands for golf courses and other landscaped areas because they are projected to grow at different rates. Irrigated landscape and golf course acres were calculated using the permitted REC acreage from the SFWMD regulatory database (**Table B-26**). Only 334 golf course acres are irrigated under a water use permit (**Chapter 2**, Table 2-9). Under average rainfall conditions, this land use required an estimated 0.80 mgd in 2017. Golf course acreage and associated water demands are projected to remain steady through 2040. Within the REC category, 354 permitted acres of land were attributed to landscape irrigation in 2017 (**Chapter 2**, Table 2-9). Landscape irrigation was assumed to increase at the same rate as the counties' permanent resident populations. This approach is used in other planning areas within the SFWMD and by other water management districts in Florida.

Table B-26. REC acres in the LKB Planning Area.

County[1]	2017	2020	2025	2030	2035	2040
Glades[2]	2	2	2	2	2	2
Highlands	264	265	266	266	267	268
Okeechobee	422	429	438	446	452	458
LKB Planning Area Total	**688**	**696**	**706**	**714**	**721**	**728**

LKB = Lower Kissimmee Basin; REC = Recreational/Landscape Irrigation.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

REC Projection Results

REC gross irrigation demand projections under average rainfall conditions are presented in **Table B-27**. **Table B-28** shows the additional quantity of water provided to meet projected demands during 1-in-10 year drought conditions.

Table B-27. REC gross irrigation demands under average rainfall conditions in the LKB Planning Area.

County[1]	Demand – Average Rainfall Conditions (mgd)					
	2017	2020	2025	2030	2035	2040
Glades[2]	0.00	0.00	0.01	0.01	0.01	0.01
Highlands	0.63	0.63	0.63	0.64	0.64	0.64
Okeechobee	1.01	1.02	1.04	1.06	1.08	1.09
LKB Planning Area Total	**1.64**	**1.66**	**1.68**	**1.70**	**1.72**	**1.73**

LKB = Lower Kissimmee Basin; mgd = million gallons per day; REC = Recreational/Landscape Irrigation.

[1] Values listed are only for the areas within the LKB Planning Area boundaries.

[2] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

Table B-28. REC gross irrigation demands under 1-in-10 year drought conditions in the LKB Planning Area.

County[1]	Demand – 1-in-10 Year Drought Conditions (mgd)					
	2017	2020	2025	2030	2035	2040
Glades[2]	0.01	0.01	0.01	0.01	0.01	0.01
Highlands	0.73	0.73	0.73	0.74	0.74	0.74
Okeechobee	1.17	1.19	1.21	1.23	1.25	1.27
LKB Planning Area Total	**1.90**	**1.92**	**1.95**	**1.98**	**1.99**	**2.01**

LKB = Lower Kissimmee Basin; mgd = million gallons per day; REC = Recreational/Landscape Irrigation.

[1] Values listed are only for the areas within the LKB Planning Area boundaries.

[2] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

POWER GENERATION

Demands under the PWR category include use of groundwater, fresh surface water, or reclaimed water by thermoelectric power generation facilities. There were two power generation facilities discussed in the 2014 LKB Plan (SFWMD 2014): a TECO Energy power station in Highlands County near the City of Sebring; and the Indiantown Cogeneration Plant, which is located in Martin County (part of the Upper East Coast Planning Area) but relies on surface water from the L-63N Canal (Taylor Creek) within the LKB Planning Area. Since the last plan, the TECO Energy facility has permanently closed. The Indiantown Cogeneration Plant, which is operated by Florida Power & Light (FPL), currently is on standby and not using any water. The cogeneration plant is anticipated to remain on standby for the foreseeable future.

The are no power demands estimated for 2017 due to the change in status of the two power generation facilities reported in the 2014 LKB Plan (SFWMD 2014). The power needs of the LKB Planning Area currently are met by facilities located outside of the planning area. There are no new power generation facilities planned. Therefore, PWR demands are projected to remain at 0.00 mgd through 2040.

SUMMARY OF DEMAND PROJECTIONS

Total demands for the LKB Planning Area are anticipated to increase by 12.07 mgd (5 percent), largely due to increased demands from the AGR category. More than 90 percent of the demand growth is attributable to AGR. The combined PWS and DSS demands are expected to increase 12 percent, to 5.67 mgd by 2040, with the projected population growth of 6,166 permanent residents. The demands for all remaining categories (REC, ICI, and PWR) are small and projected to be 3.69 mgd, combined, in 2040. Gross water demands in 5-year increments, by county and water use category, are provided in **Table B-29** for average rainfall conditions and **Table B-30** for 1-in-10 year drought conditions.

Table B-29. Summary of gross water demands under average rainfall conditions in the LKB Planning Area, by water use category.

County[1]	Water Use Category	Demand – Average Rainfall Conditions (mgd)						
		2015	2017	2020	2025	2030	2035	2040
Glades[2]	PWS	0.36	0.37	0.39	0.41	0.42	0.43	0.44
	DSS	0.06	0.06	0.06	0.06	0.06	0.07	0.07
	AGR	74.02	74.02	83.34	92.72	99.41	109.86	117.74
	ICI	0.67	0.68	0.70	0.73	0.75	0.77	0.79
	REC	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	PWR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Glades County Total	**75.12**	**75.14**	**84.50**	**93.92**	**100.64**	**111.14**	**119.05**
Highlands	PWS	0.26	0.26	0.26	0.27	0.28	0.29	0.29
	DSS	0.42	0.43	0.44	0.46	0.47	0.48	0.49
	AGR	129.07	129.07	125.07	119.48	115.09	107.35	103.64
	ICI	0.93	0.95	0.97	1.01	1.03	1.06	1.08
	REC	0.63	0.63	0.63	0.63	0.64	0.64	0.64
	PWR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highlands County Total	**131.30**	**131.33**	**127.36**	**121.84**	**117.51**	**109.80**	**106.13**
Okeechobee	PWS	2.38	2.42	2.46	2.52	2.58	2.62	2.66
	DSS	1.50	1.53	1.57	1.62	1.66	1.69	1.72
	AGR	33.93	33.93	32.90	30.81	30.16	27.42	26.75
	ICI	0.07	0.07	0.08	0.08	0.08	0.08	0.08
	REC	0.99	1.01	1.02	1.04	1.06	1.08	1.09
	PWR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Okeechobee County Total	**38.87**	**38.96**	**38.03**	**36.07**	**35.54**	**32.88**	**32.31**
LKB Planning Area Total		**245.29**	**245.42**	**249.89**	**251.84**	**253.70**	**253.83**	**257.49**

AGR = Agricultural Irrigation; DSS = Domestic and Small Public Supply; ICI = Industrial/Commercial/Institutional; LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWS = Public Water Supply; PWR = Power Generation; REC = Recreational/Landscape Irrigation.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

Table B-30. Summary of gross water demands under 1-in-10 year drought conditions in the LKB Planning Area, by water use category.

County[1]	Water Use Category	Demand – 1-in-10 Year Drought Conditions (mgd)						
		2015	2017	2020	2025	2030	2035	2040
Glades[2]	PWS	0.38	0.39	0.41	0.43	0.44	0.45	0.47
	DSS	0.06	0.06	0.06	0.07	0.07	0.07	0.07
	AGR	87.89	87.89	98.70	109.65	117.75	129.91	139.09
	ICI	0.67	0.68	0.70	0.73	0.75	0.77	0.79
	REC	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	PWR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Glades County Total	**89.01**	**89.03**	**99.88**	**110.89**	**119.01**	**131.20**	**140.43**
Highlands	PWS	0.26	0.26	0.27	0.28	0.29	0.30	0.30
	DSS	0.45	0.46	0.47	0.49	0.50	0.51	0.52
	AGR	153.54	153.54	148.66	141.97	136.77	127.62	123.19
	ICI	0.93	0.95	0.97	1.01	1.03	1.06	1.08
	REC	0.73	0.73	0.73	0.73	0.74	0.74	0.74
	PWR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Highlands County Total	**155.91**	**155.94**	**151.10**	**144.48**	**139.33**	**130.22**	**125.83**
Okeechobee	PWS	2.51	2.56	2.61	2.68	2.73	2.78	2.82
	DSS	1.60	1.63	1.67	1.71	1.76	1.79	1.83
	AGR	39.74	39.74	38.45	35.99	35.20	31.91	31.11
	ICI	0.07	0.07	0.08	0.08	0.08	0.08	0.08
	REC	1.15	1.17	1.19	1.21	1.23	1.25	1.27
	PWR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Okeechobee County Total	**45.08**	**45.17**	**43.99**	**41.67**	**41.01**	**37.81**	**37.11**
LKB Planning Area Total		**290.00**	**290.14**	**294.97**	**297.03**	**299.35**	**299.24**	**303.36**

AGR = Agricultural Irrigation; DSS = Domestic and Small Public Supply; ICI = Industrial/Commercial/Institutional; LKB = Lower Kissimmee Basin; mgd = million gallons per day; PWS = Public Water Supply; PWR = Power Generation; REC = Recreational/Landscape Irrigation.

1 Values listed are only for the areas within the LKB Planning Area boundaries.

2 The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

DEMAND PROJECTIONS IN PERSPECTIVE

Demand projections presented in this 2019 LKB Plan Update are based on the best available information. **Table B-31** shows the 2035 average gross demands projected in the 2014 LKB Plan compared to the 2040 demands projected in this 2019 LKB Plan Update. The projection for 2040 in this 2019 LKB Plan Update is 16 percent higher than the estimated 2035 demand projected in the 2014 LKB Plan. The projections reflect trends, economic circumstances, and industry intentions that will change over time. In addition, the AGR, ICI, and REC projections presented in this plan update were developed using a different methodology than was used in the 2014 LKB Plan in order to improve accuracy and use the best available data. Like any predictive tool based on past assumptions, there is uncertainty and a margin for error.

Table B-31. Comparison of gross water demands under average rainfall conditions at the end of the respective planning horizons in the 2014 LKB Plan and this 2019 LKB Plan Update.

Water Use Category	2014 LKB Plan 2035 Demand (mgd)	2019 LKB Plan Update 2040 Demand (mgd)
Average Rainfall Conditions		
Public Water Supply	3.4	3.39
Domestic and Small Public Supply	2.6	2.28
Agricultural Irrigation	185.0	248.14
Industrial/Commercial/Institutional	23.9	1.95
Recreational/Landscape Irrigation	6.4	1.73
Power Generation	0.7	0.00
LKB Planning Area Total	**222.0**	**257.49**
1-in-10 Year Drought Conditions		
Public Water Supply	4.1	3.59
Domestic and Small Public Supply	3.2	2.42
Agricultural Irrigation	250.2	293.39
Industrial/Commercial/Institutional	23.9	1.95
Recreational/Landscape Irrigation	0.9	2.01
Power Generation	6.4	0.00
LKB Planning Area Total	**288.7**	**303.36**

LKB = Lower Kissimmee Basin; mgd = million gallons per day.

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C

MFLs and Recovery and Prevention Strategies

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Regional water supply plans must be based on at least a 20-year planning period and include, among other items, Minimum Flow and Minimum Water Level (MFL) criteria and associated recovery and prevention strategies adopted in the planning area [Section 373.709, Florida Statutes (F.S.)]. MFLs and recovery and prevention strategies have been adopted for Lake Istokpoga, Lake Okeechobee, and the Lower West Coast Aquifers located wholly or partially within the Lower Kissimmee Basin (LKB) Planning Area of the South Florida Water Management District (SFWMD or District). MFLs and the associated recovery and prevention strategy for Lake Okeechobee and the Lower West Coast Aquifers affect portions of the LKB Planning Area but are included in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018) and *2017 Lower West Coast Water Supply Plan Update* (SFWMD 2017), respectively.

LEGAL BASIS

Minimum Flows and Minimum Water Levels

The overall goal of Chapter 373, F.S., is to ensure the sustainability of water resources in Florida [Section 373.016, F.S.]. Chapter 373, F.S., provides the state's water management districts with several tools to carry out this responsibility, including authority to establish MFLs. MFL criteria are flows or levels at which water resources, or the ecology of the area, would experience significant harm from further withdrawals. Significant harm is defined in Subsection 40E-8.021(31), Florida Administrative Code (F.A.C.), as the temporary loss of water resource functions, which results from a change in surface water or groundwater hydrology that takes more than 2 years to recover but is considered less severe than serious harm (**Figure C-1**). Significant harm is more severe than the no-harm standard imposed during the water use permitting process, which is based on a 1-in-10 year drought level of certainty. In a natural system, MFLs would not be exceeded until rainfall conditions exceeded the 1-in-10 year drought level of certainty permitting criteria. An MFL exceedance occurs when the water body falls below a minimum flow or minimum water level for longer than specified for that water body [Subsection 40E-8.021(17), F.A.C.].

Lake Istokpoga

MFL water bodies approaching their MFL threshold criteria are factors the District Governing Board considers when contemplating water shortage restrictions. However, MFL criteria do not trigger water shortage restrictions during climatic conditions less severe than a 1-in-10 year drought. The District Governing Board may impose water shortage restrictions if an MFL exceedance occurs, or is projected to occur, during climatic conditions more severe than a 1-in-10 year drought, to the extent consumptive uses contribute to such exceedance.

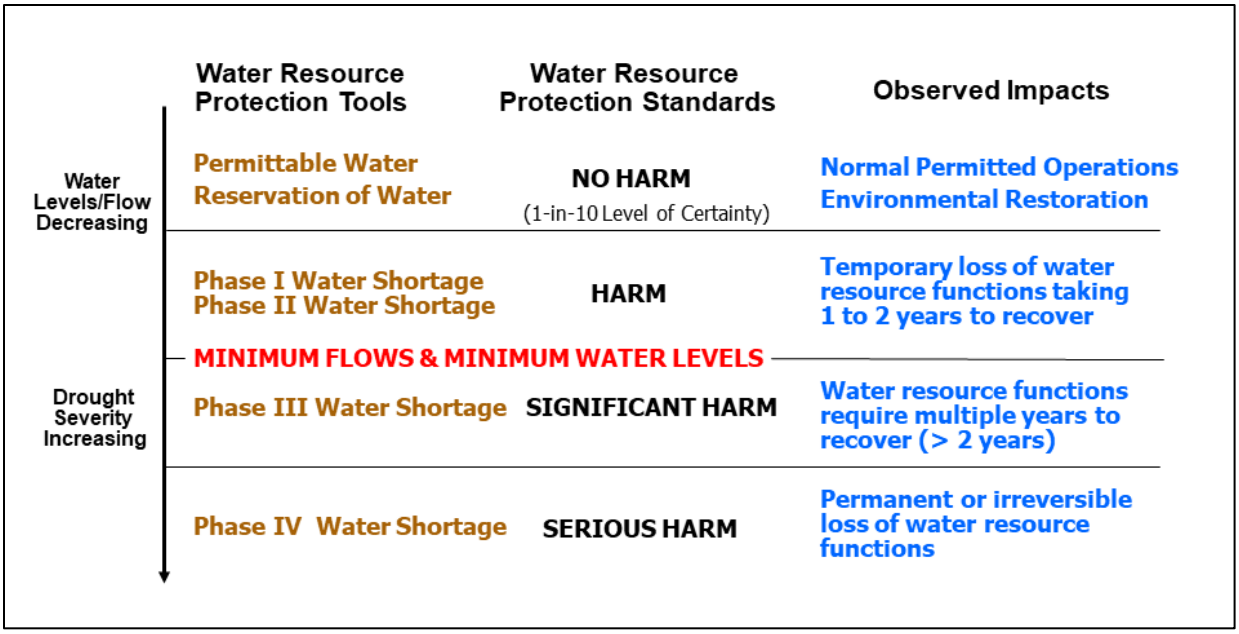

Figure C-1. Conceptual relationship among water resource protection standards at various levels of water resource harm (Modified from: Rule 40E-8.421, Florida Administrative Code).

MFL criteria are applied individually to affected water bodies. When establishing MFLs, the District Governing Board considers changes and structural alterations to watersheds, surface waters, and aquifers as well as the effects such changes or alterations have had and the constraints such changes or alterations have placed on the hydrology of an affected watershed, surface water body, or aquifer [Section 373.0421, F.S.].

Between 2001 and 2006, MFLs were adopted for three water bodies located wholly or partially within the LKB Planning Area: Lake Istokpoga, Lake Okeechobee, and the Lower West Coast Aquifers (**Figure C-2**). Recovery or prevention strategies were developed and adopted for each of these water bodies simultaneously with MFL adoption.

Ritta Island in Lake Okeechobee

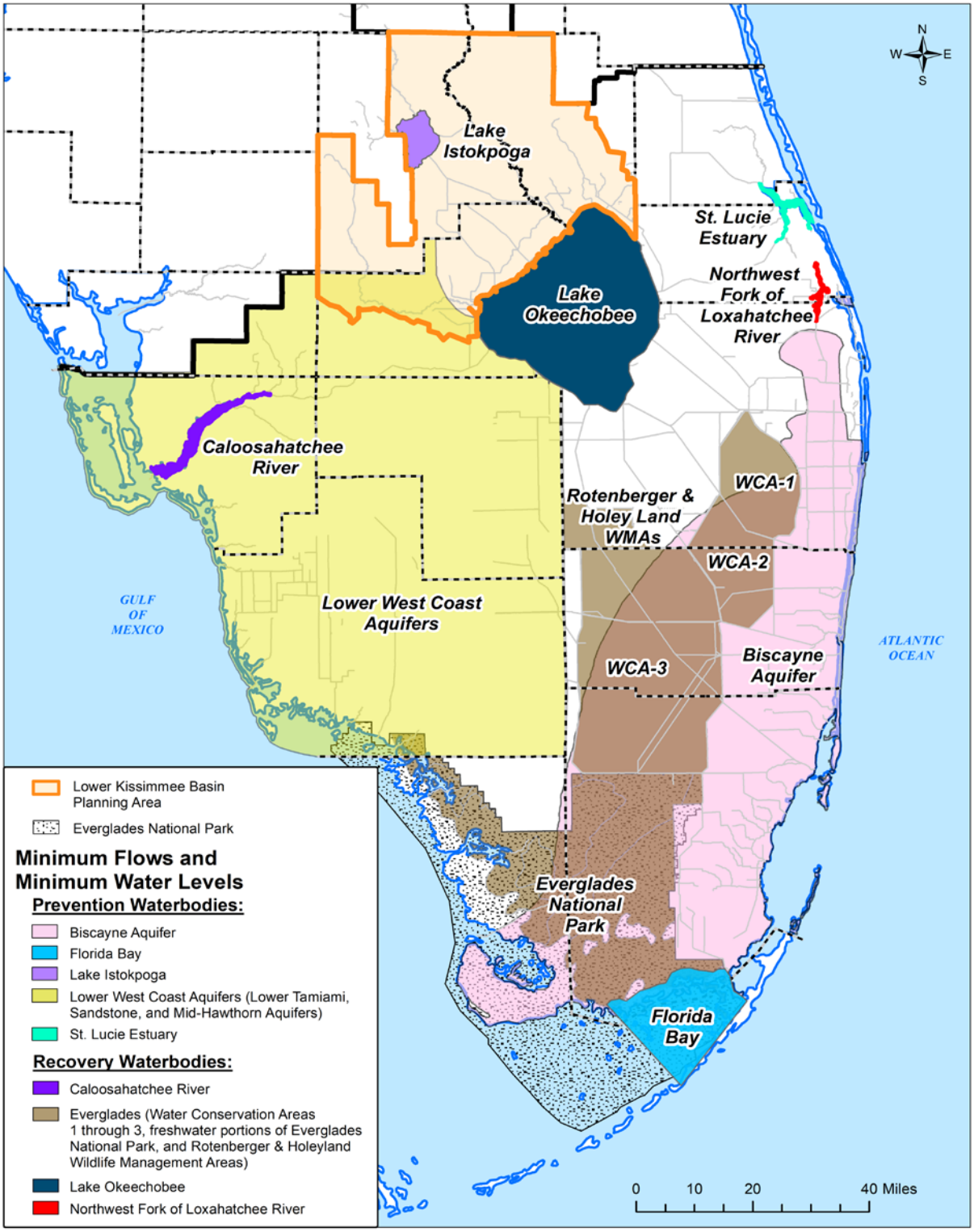

Figure C-2. Adopted Minimum Flows and Minimum Water Levels in the South Florida Water Management District.

Recovery and Prevention Strategies

Water management districts must adopt and implement a recovery or prevention strategy for water bodies with flows or levels that are below, or are projected to fall within 20 years below, the adopted MFL criteria [Section 373.0421, F.S.]. Analyses of current and future conditions are conducted for each water body for which MFL criteria are defined. MFL recovery strategies are developed when MFL criteria are currently violated [Subsection 40E-8.021(25), F.A.C.]. MFL prevention strategies are developed when MFL criteria are not currently violated but are projected to be violated within 20 years of the establishment of the MFL [Subsection 40E-8.021(24), F.A.C.]. Regional water supply plans must contain recovery and prevention strategies needed to achieve compliance with MFLs during the planning period [Section 373.709, F.S.]. The recovery or prevention strategy must include a list of projects that develop additional water supplies and other actions. The phasing or timetable for each project must be included in the strategy. Section 373.0421(2), F.S. provides the following:

> *The recovery or prevention strategy must include a phased-in approach or a timetable which will allow for the provision of sufficient water supplies for all existing and projected reasonable-beneficial uses, including development of additional water supplies and implementation of conservation and other efficiency measures concurrent with and, to the maximum extent practical, to offset reductions in permitted withdrawals, consistent with this chapter.*

Recovery and prevention strategies can consist of multiple components, including capital projects, regulatory measures and requirements, water shortage measures, environmental projects, and other research and monitoring. These components may include development of additional water supplies and implementation of conservation and other efficiency measures. Projects will develop existing water sources or replace them with alternative water supplies to provide sufficient water for all existing and projected reasonable-beneficial uses, consistent with Section 373.0421, F.S.

In the LKB Planning Area, a recovery strategy was developed and adopted for Lake Okeechobee [Subsection 40E-8.421(2), F.A.C.] and prevention strategies were developed and adopted for the Lower West Coast Aquifers and Lake Istokpoga [Subsections 40E-8.421(4) and (7), F.A.C.]. The MFLs and recovery and prevention strategies for Lake Okeechobee and the Lower West Coast Aquifers affect portions of the LKB Planning Area but are included in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018) and *2017 Lower West Coast Water Supply Plan Update* (SFWMD 2017), respectively.

MFL Recovery and Prevention Strategy Components	
Capital Projects	Capital projects include the planning, design, permitting, and construction of features to provide water to meet MFL criteria. The scale of these projects can range from relatively simple water control structures or conveyance improvements to large, regionally important features such as reservoirs, water preserve areas, or wetlands. Many of these projects are established through cost-share agreements or other partnerships among multiple agencies to provide funding and direction that would be impossible for a single agency to support.
Regulatory Measures and Requirements	When a recovery strategy has been established for an MFL water body, existing permitted allocations will not be modified or revoked prior to permit expiration unless the permitted use changes or a new or alternative source is in place and operating to supply the water historically provided from the MFL water body. For new water use permit applications, applicants are required to comply with all conditions of issuance. When existing permits are renewed or modified, the modifications are based on conditions at issuance. The rules implementing water resource protection tools, including Chapters 40E-2 and 40E-8, F.A.C., and the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (Applicant's Handbook; SFWMD 2015), identify the specific factors and constraints that will be applied to evaluate consumptive uses proposing to withdraw from MFL water bodies.
Water Shortage Measures	The SFWMD may impose water shortage restrictions to curb water use withdrawals pursuant to Sections 373.175 and 373.246, F.S. The SFWMD implements its water shortage authority by restricting water uses based on the concept of shared adversity between users and the water resources [Chapters 40E-21 and 40E-22, F.A.C.]. Under this program, different phases of water shortage restrictions with varying levels of cutbacks are imposed relative to drought conditions. The four phases of water shortage restrictions are based on progressively increasing resource impacts leading up to serious harm. Under the current program, Phases I and II primarily reduce water use through conservation techniques and minor use restrictions that affect all users. While each phase has cutbacks for irrigated lands, Phases III and IV require use cutbacks associated with increased likelihood of more significant economic impact to the users such as the potential for crop loss and turf damage due to irrigation restrictions. Established MFLs are considered in the evaluation of current water conditions [Paragraph 40E-21.221(3)(d), F.A.C.] and as one of the criteria for imposing water use restrictions [Paragraph 40E-21.271(3)(d), F.A.C.]. This plan update and Chapter 40E-8, F.A.C., do not propose use of Chapter 40E-21, F.A.C., as an MFL recovery strategy. However, when a drought occurs, the SFWMD will rely on the water shortage plan of Chapter 40E-21, F.A.C., as needed to address regional system water availability. To the extent practicable, the SFWMD attempts to implement water deliveries to reduce or prevent MFL criteria from being exceeded. For example, Lake Okeechobee operational guidelines needed to implement water supply deliveries to avoid MFL exceedances, in concert with meeting other required water demands, are identified in the *Final Adaptive Protocols for Lake Okeechobee Operations* (SFWMD 2010).
Environmental Projects and Other Research and Monitoring	Operational protocols and habitat enhancement projects are implemented to improve flows and levels, mitigate impacts from flow or level extremes, and protect key habitats. Periodic assessment of flows and levels as well as monitoring vegetation and infauna populations, and other research and monitoring, may be included to assess the effects of MFLs and ensure sufficient water is available from the regional system to meet the MFL.

LOWER KISSIMMEE BASIN MFL WATER BODIES

As stated previously, the MFLs and recovery and prevention strategies for Lake Okeechobee and the Lower West Coast Aquifers affect portions of the LKB Planning Area but are included in the *2018 Lower East Coast Water Supply Plan Update* (SFWMD 2018) and *2017 Lower West Coast Water Supply Plan Update* (SFWMD 2017), respectively.

Lake Istokpoga

MFL Criteria

Osprey Nesting on Lake Istokpoga

Lake Istokpoga covers 27,692 acres, making it the fifth largest lake in Florida (**Figure C-2**). The lake is shallow, averaging 4 to 6 feet in depth. It is fed by two creeks, Arbuckle Creek and Josephine Creek, and is connected to Lake Okeechobee through the Indian Prairie Canal System. The water level in Lake Istokpoga is controlled by operation of the G-85 (replaced by S-67) and S-68 water control structures in accordance with the Lake Istokpoga Regulation Schedule adopted by the United States Army Corps of Engineers and implemented by the SFWMD (**Chapter 4**, Figure 4-4). Lake Istokpoga is defined in Subsection 40E-8.021(11), F.A.C., as the lands and waters contained within the lake below 40 feet National Geodetic Vertical Datum of 1929 (NGVD29), the top of the Lake Istokpoga Regulation Schedule.

Surface water from Lake Istokpoga and its associated canals traditionally has been used to meet irrigation demands in the Indian Prairie Basin between Lake Istokpoga and Lake Okeechobee in Highlands and Glades counties. This area includes the Seminole Tribe of Florida's Brighton Reservation and the Istokpoga Marsh Watershed Improvement District, both of which receive water from Lake Istokpoga and the canal system through agreements with the SFWMD. Additionally, approximately 10,000 acres of agricultural lands within the IMWID have separate SFWMD individual water use permits for various reasons, including use of groundwater wells not covered by the surface water agreement.

Historically, most irrigation demands in these areas have been met with water from Lake Istokpoga and the canal system. However, a lack of water storage capacity in the watershed and the challenges of flood control do not allow significant storage of water for use during periods of drought, when rainfall has been insufficient to maintain the lake above Zone C of the Lake Istokpoga Regulation Schedule (**Chapter 4**, Figure 4-4). During such periods, the SFWMD may implement water restrictions to limit water use from the lake and canal system. For instance, multiple water restrictions were implemented in the Indian Prairie Basin from before 2006 through 2011.

To protect water levels in Lake Istokpoga, an MFL of 36.5 feet NGVD29 was adopted in 2006 [Subsection 40E-8.351, F.A.C.]. Significant harm criteria are based on the relationship between water levels in the lake and the health of littoral zone wetlands, which provide habitat for ecologically and economically important fish and wildlife; navigational and recreational access; and maintenance of historical runoff from Lake Istokpoga through the Indian Prairie Basin and canal system to Lake Okeechobee (SFWMD 2005). An MFL violation occurs in Lake Istokpoga when surface water levels fall below 36.5 feet NGVD29 for 20 or more weeks, within a calendar year, more often than once every 4 years.

A Restricted Allocation Area (RAA) for Lake Istokpoga/Indian Prairie Canal System was established in 1981 (Subsection 3.2.1.A of the Applicant's Handbook [SFWMD 2015]) that prohibits additional surface water allocations from the lake and canal system above existing allocations and any increases in surface water pump capacity. The RAA reduces the potential for District-declared water shortages in the basin during dry periods and prevents new users from reducing the level of certainty for existing permitted users and Tribal entitlements.

Prevention Strategy

At the time of MFL adoption, Lake Istokpoga was meeting the MFL and no violations were anticipated to occur in the next 20 years. Therefore, a prevention strategy [Subsection 40E-8.421(7), F.A.C.] was adopted for it simultaneously with MFL adoption. The prevention strategy for Lake Istokpoga consists of continuation of the current operational plan and regulation schedule as well as planning and operating extreme lake drawdowns in coordination with other agencies for environmental purposes in a manner that avoids an MFL violation [Section 40E-8.421(7), F.A.C.].

Further information about the MFLs and recovery and prevention strategies adopted for the LKB Planning Area, and throughout the District, can be found in Chapter 40E-8, F.A.C., and on the SFWMD website at www.sfwmd.gov/mfls. More information on the RAA established for the Lake Istokpoga/Indian Prairie Canal System is provided in **Chapter 4** of this plan update and in Subsection 3.2.1 of the Applicant's Handbook (SFWMD 2015).

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Wastewater Treatment Facilities

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Wastewater treatment is accomplished through regional wastewater treatment facilities (WWTFs), smaller "package plants," and septic tanks. This appendix focuses on the larger facilities with a Florida Department of Environmental Protection (FDEP) permitted treatment capacity of 0.10 million gallons per day (mgd) or greater. These larger treatment facilities allow economy of operation, reduce risk of treatment upset, and have sufficient flows that could positively impact water resources through use of reclaimed water.

As of 2019, there are four domestic wastewater treatment facilities within the LKB Planning Area with a permitted treatment capacity of 0.10 mgd or greater (**Figure D-1**). The Okeechobee Utility Authority, Okeechobee Correctional Institution, and Sebring Airport report wastewater and reuse flows to the FDEP. The Seminole Tribe of Florida Brighton Reservation facility is not required to report flows to the FDEP. **Table D-1** lists the LKB Planning Area's reuse facilities and provides the 2017 annual average daily flows. **Table D-2** shows reuse predictions for 2040 for the same utilities. Existing reclaimed water use within the LKB Planning Area is based on FDEP's 2017 Reuse Inventory (FDEP 2018), with projections for 2040 based on a ratio or percentage of the projected potable water used by the same utility.

Table D-1. Summary of 2017 water reuse facilities within the LKB Planning Area with a capacity of 0.10 mgd or greater (From: FDEP 2018).

Entity/Facility[a]	Residential Irrigation (mgd)	Golf Course Irrigation (mgd)	Agricultural Irrigation (mgd)	Other Public Access Irrigation[b] (mgd)	Groundwater Recharge[c] (mgd)	Other Reuse Types[d] (mgd)
Sebring Airport	0.00	0.00	0.04	0.00	0.00	0.00
Okeechobee Correctional Institution	0.00	0.00	0.19	0.00	0.00	0.00
Okeechobee Utility Authority	0.00	0.00	0.33	0.00	0.00	0.04
Total	**0.00**	**0.00**	**0.56**	**0.00**	**0.00**	**0.04**

[a] The Seminole Tribe of Florida Brighton Reservation facility does not provide reclaimed water for reuse.
[b] Other public access irrigation includes parks, schools, common areas, etc.
[c] Groundwater recharge includes rapid infiltration basins, percolation ponds, etc.
[d] Other reuse types includes other permitted uses, such as cooling water at the treatment facility or at other facilities, toilet flushing, etc.

Table D-2. Projected 2040 reuse by wastewater facilities within the LKB Planning Area with a capacity of 0.10 mgd or greater.

Entity/Facility[a]	Residential Irrigation (mgd)	Golf Course Irrigation (mgd)	Agricultural Irrigation (mgd)	Other Public Access Irrigation[b] (mgd)	Groundwater Recharge[c] (mgd)	Other Reuse Types[d] (mgd)
Sebring Airport	0.00	0.00	0.04	0.00	0.00	0.00
Okeechobee Correctional Institution	0.00	0.00	0.19	0.00	0.00	0.00
Okeechobee Utility Authority	0.00	0.00	0.37	0.00	0.00	0.05
Total	**0.00**	**0.00**	**0.60**	**0.00**	**0.00**	**0.05**

[a] The Seminole Tribe of Florida Brighton Reservation facility is not expected to provide reclaimed water.
[b] Other public access irrigation includes parks, schools, common areas, etc.
[c] Groundwater recharge includes rapid infiltration basins, percolation ponds, etc.
[d] Other reuse types includes other permitted uses, such as cooling water at the treatment facility or at other facilities, toilet flushing, etc.

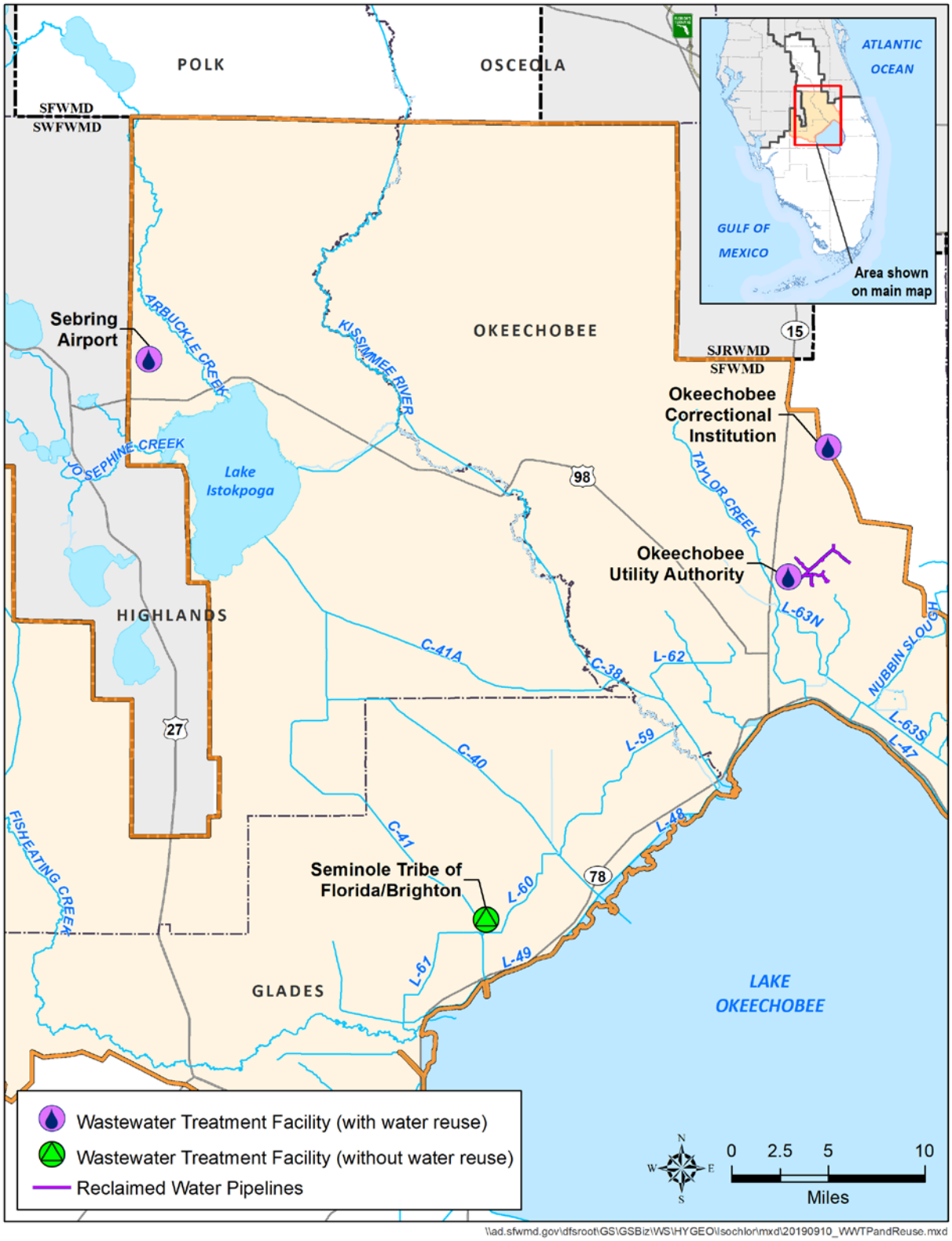

Figure D-1. Wastewater treatment facilities in the LKB Planning Area with a permitted capacity of 0.10 mgd or greater.

SEBRING AIRPORT WWTF

Existing Wastewater/Reclaimed

The Sebring Airport WWTF has an FDEP-rated capacity of 0.10 mgd with a flow of 0.04 mgd in 2017. All treated wastewater from the facility (0.04 mgd) is used to irrigate spray fields.

Future Wastewater/Reclaimed

The Sebring Airport currently has no known plans to expand its wastewater system beyond its current design; therefore, reclaimed water use is expected to remain at 0.04 mgd.

OKEECHOBEE CORRECTIONAL INSTITUTION WWTF

Existing Wastewater/Reclaimed

The Okeechobee Correctional Institution WWTF has an FDEP-rated capacity of 0.20 mgd with a flow of 0.19 mgd in 2017. The system uses extended aeration and disposal by spray field irrigation after basic disinfection. Reclaimed water use for on-site crops in 2017 was 0.19 mgd.

Future Wastewater/Reclaimed

The Okeechobee Correctional Institution currently has no plans to expand its wastewater system beyond its current design. Given that the facility is not growing, reclaimed water use is expected to remain at 0.19 mgd.

OKEECHOBEE UTILITY AUTHORITY WWTF

Existing Wastewater/Reclaimed

The Okeechobee Utility Authority WWTF has an FDEP-rated capacity of 3.00 mgd. In 2017, the average daily wastewater flow treated by the facility was 0.99 mgd, of which 0.33 mgd was reused for irrigation of grass, hay, and an adjoining 781-acre citrus grove. Additionally, the utility provides reclaimed water for on-site irrigation and other incidental uses related to internal processes.

Future Wastewater/Reclaimed

The Okeechobee Utility Authority currently has no plans to expand its reclaimed water system beyond its current design. The utility has examined expanding its wastewater service into the remaining areas of the City of Okeechobee and surrounding unincorporated areas of Okeechobee and Glades counties. Based on projected growth, the wastewater flows at the Okeechobee Utility Authority WWTF are projected to increase to 1.10 mgd by 2040 and reuse to increase to 0.42 mgd.

REFERENCES

FDEP. 2018. *2017 Reuse Inventory.* Water Reuse Program, Florida Department of Environmental Protection, Tallahassee, FL.

E

Public Water Supply Utility Summaries

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This appendix provides summaries of the Public Water Supply (PWS) utilities that provide 0.10 million gallons per day (mgd) or greater of net (finished) potable water within the Lower Kissimmee Basin (LKB) Planning Area (**Table E-1**). For this *2019 Lower Kissimmee Basin Water Supply Plan Update* (2019 LKB Plan Update), South Florida Water Management District (SFWMD) staff updated the utility summaries from the *2014 Lower Kissimmee Basin Water Supply Plan* (SFWMD 2014) with data from the Florida Department of Environmental Protection (FDEP 2019) and the SFWMD's water use regulatory database. Each summary was shared with its specific utility for review and feedback. To help explain the information in the utility summaries, a sample profile with descriptions is provided. The utility summaries are ordered alphabetically by county for easy navigation. **Figure E-1** shows the locations of the PWS wellfields in the LKB Planning Area. Potential future water conservation savings are addressed in **Chapter 3** and not included in the utility summaries herein.

INFO ⓘ

Acronyms

ASR – aquifer storage and recovery

FAS – Floridan aquifer system

RO – reverse osmosis

SAS – surficial aquifer system

WTP – water treatment plant

Table E-1. Summary of the public water supply utilities with a capacity of 0.10 mgd or greater in the LKB Planning Area.

Supply Entity/Facility	SFWMD Permit Number	Gross (Raw) Water (mgd)			FDEP PWS ID	Rated Net (Finished) Capacity (mgd)
		Annual Allocation	SAS	FAS		
Glades County						
Lakeport Water Association	N/A[a]	0.00	0.00	0.00	5220166	0.35
Seminole Tribe of Florida (Brighton)[b]	N/A[c]	0.58	0.00	0.58	N/A	2.80
Glades County Total		**0.58**	**0.00**	**0.58**		**3.15**
Highlands County						
Sebring, City of (Airport)	28-00139-W	0.12	0.00	0.12	6280250	1.00
Spring Lake Improvement District	28-00122-W	0.42	0.00	0.42	5280266	1.00
Highlands County Total		**0.54**	**0.00**	**0.54**		**2.00**
Okeechobee County						
Okeechobee Correctional Institution	47-00421-W	0.19	0.00	0.19	4474497	0.86
Okeechobee Utility Authority	47-00004-W	3.48[d]	3.48	0.00	4470257	5.99
Okeechobee County Total		**3.67**	**3.48**	**0.19**		**6.85**
LKB Planning Area Total		**4.79**	**3.48**	**1.31**		**12.00**

FAS = Floridan aquifer system; FDEP = Florida Department of Environmental Protection; mgd = million gallons per day; PWS ID = Public Water Supply identification number; SAS = surficial aquifer system; SFWMD = South Florida Water Management District.

[a] Does not treat raw water and therefore does not have an SFWMD water use permit. Treated water is provided by the Seminole Tribe of Florida Brighton utility.

[b] The Seminole Tribe of Florida is a sovereign Indian Tribe and an independent Tribal Government separate from Glades County. However, for discussion purposes, information relating to the Seminole Tribe of Florida Brighton Reservation is included in the calculations for Glades County.

[c] Allocation was established in the 1987 Water Rights Compact, not through an SFWMD water use permit, and there is no FDEP water treatment ID for the Seminole Tribe of Florida.

[d] Includes 2.75 mgd of surface water from Lake Okeechobee and 0.73 mgd from the SAS. The allocation for surface water from Lake Okeechobee increased 1.08 mgd above the base condition allocation (1.67 mgd) by variance (Governing Board Order 2012-042-DAO-WU).

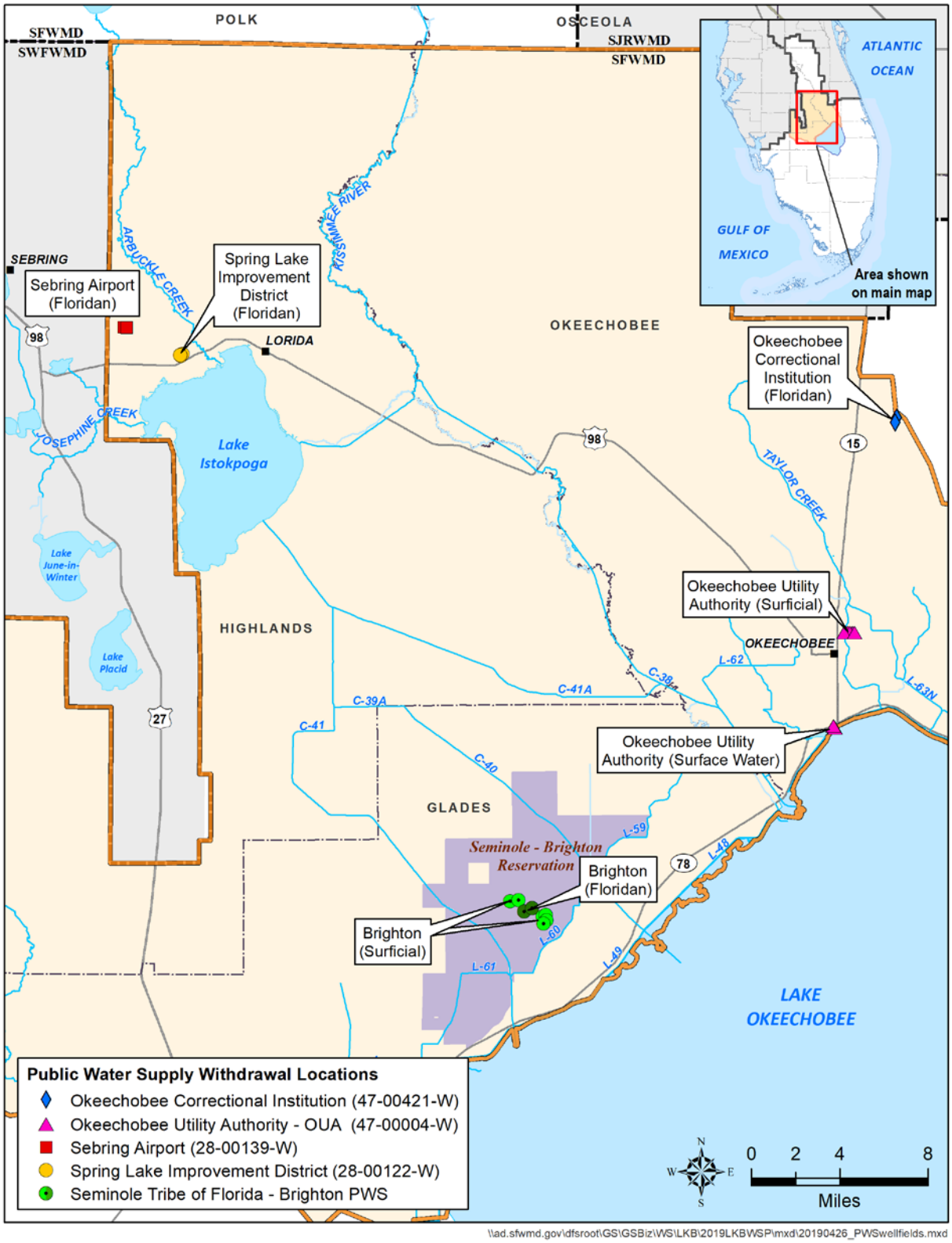

Figure E-1. Existing Public Water Supply withdrawal locations in the LKB Planning Area.

SAMPLE UTILITY COMPANY

Service Area: Sample city and portions of unincorporated county

Description: This description includes water sources, type of WTPs, and other relevant information about the utility.

Population and Finished Water Demand				
	Existing	Projected		
	2017	2020	2030	2040
Population	100,000	110,000	120,000	130,000
Average 2013-2017 Per Capita (gallons per day finished water)	100			
Potable Water Demands (daily average annual finished water in mgd)	**10.00**	**11.00**	**12.00**	**13.00**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 12-34567-W (expires 2040)			
SAS	14.00			
FAS	2.00			
Total Allocation	**16.00**			
FDEP Potable Water Treatment Capacity (mgd) (PWS ID# 1234567)				
Permitted Capacity by Source	Existing	Projected		
	2017	2020	2030	2040
SAS	18.00	18.00	18.00	18.00
FAS	0.00	2.00	3.00	3.00
Total Potable Capacity	**18.00**	**20.00**	**21.00**	**21.00**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water	1.00	1.00	4.00	4.00
ASR	2.00	2.00	3.00	3.00
Total Nonpotable Capacity	3.00	3.00	7.00	7.00

1 **Population** – The 2017 populations were determined by assigning 2010 United States Census block data and permanent resident population data published in 2018 by the Bureau of Economic and Business Research to 2017 PWS utility service areas. Project populations for each PWS utility service area are based on their respective county growth rates, also published in 2018 by the Bureau of Economic and Business Research (see **Appendix B** for more information).

2 **Average 2013-2017 Per Capita** (gallons per day finished water) – A PWS utility's per capita was calculated by dividing total net (finished) water produced each year (from monthly operating reports submitted by utilities to the FDEP) by the utility's permanent population for that year. Each utility's per capita was calculated for 2013 to 2017, then averaged for the 5 years.

3 **Potable Water Demands** (daily average annual finished water in mgd) **–** The current (2017) and projected (2020 to 2040) demands were calculated by multiplying the PWS utility's average 2013-2017 per capita by the estimated service area populations for the respective years.

4 **Allocation from the Water Use Permit** – The gross (raw) surface water and groundwater (from the SAS and FAS) allocations as described in the utility's current water use permit. The 2017 allocation is assumed to continue through 2040 unless noted otherwise.

5 **Total Allocation** – The total gross (raw) water allocation in the current water use permit. For utilities withdrawing from multiple sources, the total allocation may be less than the sum of the individual source allocations due to limits on the sources; this is indicated in the appropriate profiles.

6 **FDEP Permitted Capacity** – The existing net (finished) water capacity of the WTPs owned/operated by the utility, as provided by the FDEP (2019), split into the capacity available to process water from the SAS and the FAS. Project capacity to be completed by 2020 is shown in the 2020 column, capacity to be completed between 2021 and 2030 is in the 2030 column, and capacity to be completed between 2031 and 2040 is in the 2040 column.

7 **Nonpotable Alternative Water Source Capacity** – The capacity of the nonpotable alternative water sources, including reclaimed water, ASR, and surface water/stormwater. Reclaimed water is the wastewater treatment facility reclaimed water production capacity as provided by the FDEP (2018).

SEMINOLE TRIBE OF FLORIDA – BRIGHTON

Service Area: Seminole Tribe of Florida Brighton Reservation

Description: Raw water supplies are obtained from one UFA wellfield with backup from one SAS wellfield. RO was recently added to the existing nanofiltration WTP. The Seminole Tribe of Florida has an established surface water entitlement through the 1987 Water Rights Compact among the Seminole Tribe of Florida, the State of Florida, and the South Florida Water Management District. Utility information is based on Annual Work Plans, United States Census data, and historical water deliveries to the Lakeport Water Association.

Population and Finished Water Demand				
	Existing	Projected		
	2017	2020	2030	2040
Population	703	725	773	815
Per Capita (gallons per day finished water)	148[a]			
Potable Water Demands (daily average annual finished water in mgd)	**0.10**	**0.11**	**0.11**	**0.12**
Bulk Potable Water Demands (daily average annual finished water in mgd delivered directly to Lakeport Water Association)	0.10	0.10	0.11	0.11
Total Potable Water Demands (daily average annual finished water in mgd)	**0.20**	**0.21**	**0.22**	**0.23**
SFWMD Water Use Authorizations (mgd)				
Potable Water Source	28th Annual Work Plan			
SAS	0.00[b]			
FAS	0.58			
Total Allocation	**0.58**			
Potable Water Treatment Capacity				
Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2017	2020	2030	2040
SAS	0.80	0.80	0.80	0.80
FAS	0.00	2.00	2.00	2.00
Total Potable Capacity	**0.80**	**2.80**	**2.80**	**2.80**
Nonpotable Alternative Water Source Capacity (mgd)				
Total Nonpotable Capacity	0.00	0.00	0.00	0.00

[a] Per capita use rate obtained from the Fourth Amendment to the 28th Work Plan.
[b] SAS wells are expected to be maintained to serve as backup.

SEBRING AIRPORT

Service Area: Sebring Airport and surrounding commercial and industrial areas in Highlands County

Description: Raw water supplies are obtained from one FAS wellfield. Water is treated at one WTP using lime softening.

Population and Finished Water Demand				
	Existing	Projected		
	2017	2020	2030	2040
Per Capita (gallons per day finished water)	N/A[a]			
Potable Water Demands (daily average annual finished water in mgd)	**0.06**	**0.06**	**0.07**	**0.07**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 28-00139-W (expires 2031)			
FAS	0.12			
Total Allocation	**0.12**			
FDEP Potable Water Treatment Capacity (PWS ID # 6280250)				
Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2017	2020	2030	2040
FAS	1.00	1.00	1.00	1.00
Total Potable Capacity	**1.00**	**1.00**	**1.00**	**1.00**
Nonpotable Alternative Water Source Capacity (mgd)				
Total Nonpotable Capacity	**0.00**	**0.00**	**0.00**	**0.00**

[a] Because this utility does not provide water to a permanent population, the projected water use rate is based on historical use and projected population growth rates for Highlands County.

SPRING LAKE IMPROVEMENT DISTRICT

Service Area: The independent special district known as Spring Lake Improvement District and unincorporated areas in Highlands County

Description: Raw water supplies are obtained from one FAS wellfield. Water is treated at one WTP using lime softening.

Population and Finished Water Demand				
	Existing	Projected		
	2017	2020	2030	2040
Population	2,705	2,776	2,954	3,079
Average 2013-2017 Per Capita (gallons per day finished water)	70			
Potable Water Demands (daily average annual finished water in mgd)	**0.19**	**0.19**	**0.21**	**0.22**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 28-00122-W (expires 2039)			
FAS	0.42			
Total Allocation	**0.42**			
FDEP Potable Water Treatment Capacity (PWS ID # 5280266)				
Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2017	2020	2030	2040
FAS	1.00	1.00	1.00	1.00
Total Potable Capacity	**1.00**	**1.00**	**1.00**	**1.00**
Nonpotable Alternative Water Source Capacity (mgd)				
Total Nonpotable Capacity	**0.00**	**0.00**	**0.00**	**0.00**

OKEECHOBEE CORRECTIONAL INSTITUTION

Service Area: Okeechobee Correctional Institution

Description: Raw water supplies are obtained from one FAS wellfield. Water is treated at one WTP using aeration and disinfection.

Population and Finished Water Demand				
	Existing	Projected		
	2017	2020	2030	2040
Population	1,900	1,900	1,900	1,900
Average 2013-2017 Per Capita (gallons per day finished water)	86			
Potable Water Demands (daily average annual finished water in mgd)	**0.16**	**0.16**	**0.16**	**0.16**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 47-00421-W (expires 2035)			
FAS	0.19			
Total Allocation	**0.19**			
FDEP Potable Water Treatment Capacity (PWS ID # 5280266)				
Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2017	2020	2030	2040
FAS	0.86	0.86	0.86	0.86
Total Potable Capacity	**0.86**	**0.86**	**0.86**	**0.86**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water[a]	0.20	0.20	0.20	0.20
Total Nonpotable Capacity	**0.20**	**0.20**	**0.20**	**0.20**

[a] Reclaimed water used for on-site agricultural irrigation was 0.19 mgd, as noted in **Appendix D**.

OKEECHOBEE UTILITY AUTHORITY

Service Area: City of Okeechobee, portions of Okeechobee County, and Buckhead Ridge in Glades County

Description: Raw water supplies are obtained from one SAS wellfield and surface water from Lake Okeechobee. The Okeechobee Utility Authority operates two WTPs. Groundwater from the SAS is treated using aeration, filtration, and disinfection. Surface water from Lake Okeechobee is treated using flocculation and sedimentation, followed by ozonation, filtration, and disinfection.

Population and Finished Water Demand				
	Existing	Projected		
	2017	2020	2030	2040
Population	23,638	24,148	25,381	26,281
Average 2013-2017 Per Capita (gallons per day finished water)	99			
Potable Water Demands (daily average annual finished water in mgd)	**2.33**	**2.39**	**2.51**	**2.60**
SFWMD Water Use Permitted Allocation (mgd)				
Potable Water Source	Permit Number 47-00004-W (expires 2032)			
SAS	0.73			
Lake Okeechobee	2.75[a]			
Total Allocation	**3.48**			
FDEP Potable Water Treatment Capacity (PWS ID # 4470257)				
Capacity by Source	Cumulative Facility & Project Capacity (mgd)			
	Existing	Projected		
	2017	2020	2030	2040
SAS	1.00	1.00	1.00	1.00
Lake Okeechobee	4.99	4.99	4.99	4.99
Total Potable Capacity	**5.99**	**5.99**	**5.99**	**5.99**
Nonpotable Alternative Water Source Capacity (mgd)				
Reclaimed Water[b]	3.00	3.00	3.00	3.00
Total Nonpotable Capacity	**3.00**	**3.00**	**3.00**	**3.00**

[a] Allocation increased by 1.08 mgd above base condition allocation (1.67 mgd) by variance (Governing Board Order 2012-042-DAO-WU).

[b] In 2017, the average daily wastewater flow treated by the facility was 0.99 mgd, of which 0.33 mgd was reused for irrigation of grass, hay, and an adjoining 781-acre citrus grove. Additionally, the utility provides reclaimed water for on-site irrigation and other incidental uses related to production, as noted in **Appendix D**.

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Meeting South Florida's water supply needs
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and a shared vision.

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